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# The American Journal .. OF PROGRESSIVE THERAPEUTICS

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*Electro Therapy*

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Official Organ of The American Progressive Therapeutic Society, The Illinois State Progressive Therapeutic Society and The Chicago Progressive Therapeutic Society

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H. PRESTON PRATT, M. D., Managing Editor

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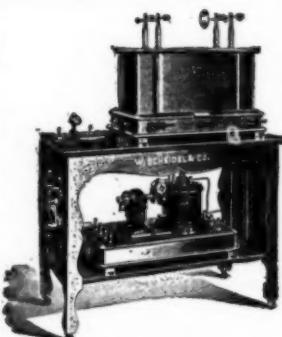
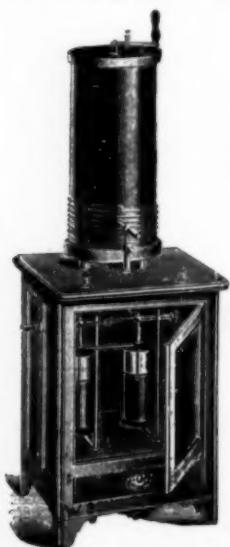
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**PROSPECTUS**

1908

# The American Journal of Progressive Therapeutics

Consolidation of THE AMERICAN X-RAY JOURNAL and  
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Published Monthly by The American X-Ray Publishing Co.

H. PRESTON PRATT, M. D., Managing Editor      T. PROCTOR HALL, Ph. D., M. D., Editor

The official organ of the American Progressive Therapeutic Society, The Illinois Progressive Therapeutic Society and The Chicago Progressive Therapeutic Society.

The American Journal of Progressive Therapeutics is devoted to Electrical Science, X-Ray Photography, Electro-Therapy, Radio-Therapy, Photo-Therapy, Thermo-Therapy, Hydro-Therapy, Animal-Therapy and Psycho-Therapy. In fact, every new therapy of value will find place in its columns. Medical, Dental and Surgical application of Electricity and allied forces.

It is the aim of this Journal to supplement this work by giving information in departments other than drug-therapy, and to offer a forum in which new views and new methods may receive a fair hearing and impartial criticism.

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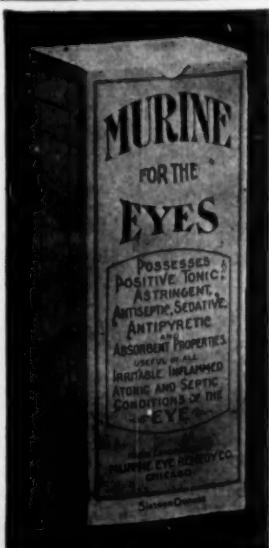
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**DR. H. C. BENNETT**  
**President of the American Progressive Therapeutic  
Society**

# THE AMERICAN JOURNAL ... OF ... PROGRESSIVE THERAPEUTICS

VOL. XVI.

CHICAGO, JANUARY, 1905.

No. 1

## The Study and Teaching of Electro-Therapeutics\*

BY H. C. BENNETT, M. D., M. E., PH. G.,  
*Lima, Ohio.*

President American Progressive Therapeutic Society.

It is with much reluctance and hesitation that I undertake to address this intelligent body of specialists, and after casting about for a subject, at last decided to do as did Antony in his oration over Caesar, viz.: "Simply speak right on, telling that which I do know," hoping that in the absence of oratory, the thoughts, suggestions, and facts offered, may be of some use to you, my fellows.

I hope and believe all of us are earnest students, and searchers after truth, and I trust that we are all to be teachers afterward. Therefore, with fifteen years' experience as a student of electro-therapy, the last six of which have been also devoted largely to teaching this subject, I hope to be able to speak intelligently of, and discuss this double subject, without excess of either enthusiasm or disparagement. The student must possess the thirst for knowledge and the persistence to attain it. The student gets his desire for a knowledge of electro-therapy from divers sources, and he seeks to attain the knowledge in various ways. The true student wants to "know how" for the love of it. He goes about it in a sys-

tematic manner, begins at the bottom, lays the foundation, and then builds his superstructure as any skilled architect would advise. He is content to first dig in the dirt to find the gold. Underlying principles, fundamental laws, elementary physics, primary chemism and simple mechanism are his delight, because, in them, he finds reasons for his madness. Such procedures lead to logical conclusions and sure deductions, which bring easy success, and prevent failure.

Some are content with skimming over the drift, and getting generalities, which without reason they must employ more or less hap-hazard and empirically. They are content to follow out directions printed on the inside of the lid of the battery box and when they succeed congratulate themselves, and when they fail wonder at the seeming paradox.

Another goes into it because it is a fad, as he thinks, and he wants to be "in the swim." He must make a show, at least. He stocks his office with a mass of glittering matter, which fills himself with joy and his patrons with amazement, but his joy soon becomes a nightmare, his matter turns to debris, and his patients' wonder is changed to fear. Knowing noth-

\*(Read before the annual session of the society, Chicago, December 2, 1904.)

ing of the whys and wherefores, he blunders, breaks, and is blamed.

Another rushes into medical electricity with a premeditation and intent to use it as a mask, behind which to hide his decadence of quackery. He makes extravagant claims and guarantees cures, without mental reservation. He knows his stay is short, and he must make haste. No matter what the steed may be, so it carries him over the bridge. His end is sure and swift, but the wrecks he leaves behind, of shattered hopes and lost beliefs in our loved science, which has been so badly misused, are the heritage of the truly scientific electro-therapeutist. He must change public opinion and restore confidence and thus we, who are the true students, must all become teachers of the dear public, whom we serve.

There is still another, who is an able physician, surgeon or scientist, who may be an authority in his specialty, who takes up electro-therapy as a side line. He is too busy, or too wise, to waste the time necessary to learn his subject properly, and is therefore handicapped at the beginning, and is forced to either trust to an incompetent assistant, or guess at it himself, consequently he has more or less (mostly less) success, and abandons the whole thing; and if he does not openly oppose it, he damns it with a faint praise, or ignores it entirely. The fact that he is a noted surgeon, or an eminent physician, or skilled specialist in some branch of medicine, does not prevent him from being a fool when it comes to electro-therapeutics.

There was a time when a physician must know all about everything. Now it is different. Specialism is the order of the day. There are good reasons for this. Medicine is too big for one mind. Now,

the doctor, of course, knows more or less about all branches, but he is almost forced to know more about one thing than another, or more than the other fellows, if he wishes to excel. Electro-therapy is now firmly established as a specialty in medicine, and if one would succeed in it he must know as much about it as possible.

When I speak about electro-therapy, I mean it in the broadest sense, yet it is so broad that it is also capable of subdivisions, any one of which might engross all our time as a specialty. I need not itemize, as you are all familiar with the formula. A careful and conscientious student is often prone to over-enthusiasm, which may defeat him. In the first rush of success in the new field, his caution may weaken, and he is liable to overdo it. Electrification in its various modalities is a powerful remedy, and is just as much a medicine as is a drug in a bottle; and in well selected cases, properly applied, it will do more and better than anything else, but it is not a cureall.

It is an axiom that a power for good when rightly used is just as much a power for harm when wrongly used, in proportion to its potential. Therefore it is a self-evident fact that it is necessary for the user of electricity as a medicine to know well his business or else let it alone.

Over-enthusiasm is sometimes more dangerous than over-conservatism. A wise mean between the extremes means the greatest measure of honor and success. We who have been longest in the work know of the difficulties we had to overcome when we began the race. The lack of knowledge was woeful, the deficiency of proper apparatus was great, the ignorance and superstition of the laity was appalling, the prejudice and opposition

of the profession was discouraging, so that we had hard sledding. But all things come, and in the language of Mrs. Wiggs, "Looks like everything in the whole world comes right, if we jes' wait long enough." The fact that we are here, and for this purpose, shows that we are right.

So much for the student; what of the teacher and his work?

The student of electro-therapeutics today has the way to knowledge made comparatively easy for him in the great mass of literature and the periodical journals, and the increasing number of schools devoted to the subject, either wholly or in part. Why, he doesn't even have to select his own apparatus or worry over which one he wants. If you do not believe it, send and get a copy of one or all of the thirty-six different catalogues, every one of which advertises a particular outfit, which is guaranteed to be the only best one on the market, and therefore is the one to buy. This is probably the easiest if not the cheapest method of getting an education. However, this way is sometimes very expensive, as the deluded buyer finds to his sorrow. He is told to get the outfit and then learn how to use it. This is sometimes advisable, but many a doctor has been persuaded to buy, only to find later that it is not what he wants.

I am frequently asked by a tyro for advice as to what to buy. There are so many things to consider, that it is always hard and sometimes impossible to give proper advice, without further details. I tell them the safest plan is to wait until they are posted, and then they can analyze their needs, and discriminate, and make their own selection to their entire satisfaction.

How is it to be taught them? A solution is offered in text-books and journals. These are good and all right in their

place, but text books, as a rule, are made to sell, and sometimes the larger the book the greater the sell. Again, most text-books give only one man's notions, and many men differ. They are prone to fill their pages with fancy theories on cobweb supports. Other text-books are conglomerations of diametrically opposed statements, which the beginner can not differentiate, and which are so confusing that he gives it up in despair, if not disgust. Journals, as a rule, are full of new and rare things, and more intended for the advanced student and specialist, who wants to keep abreast of the century.

There are two exceptions among journals and books. These are "The Electro-Therapeutist" and "The Electro-Therapeutic Guide," both published in the interest of and for the beginner, and are small and thoroly practical. Better than either self education or the general run of text-books and journals, is a carefully prepared course of lectures, by well selected and qualified teachers and writers, which may be obtained by correspondence and studied at home, at small expense, with little or no inconvenience or loss of time from work, and with much satisfaction.

Such a course was inaugurated in January, 1896, and has continued until now, with ever-increasing value and efficiency, and has been the means of imparting a practical, safe, working knowledge of the subject of electro-therapeutics to several thousand eager students, who are today using electricity successfully, because it was taught them rightly. The National College of Electro-Therapeutics was the first, and is, therefore, the oldest of its kind, and so far, it is the only school devoted exclusively to correspondence teaching of electro-therapeutics, and the writer feels glad to have been associated with it

since its early history, and has a sense of pride in its deserved popularity and success, among those who can get the desired instruction in no other way.

Following this method of teaching, what is to be always advised when possible, is to attend one or more, or all, of the several most excellent schools teaching electro-therapeutics, personally, clinically, practically and scientifically. Too much praise can not be given to these schools, nor enough credit to the able teachers therein. None of us can neglect an opportunity to perfect ourselves in our specialty. We can not learn too much, and we can never learn it all. So, let us get all the knowledge and information and light we can on electro-therapeutics and all kindred subjects. Let us not only get it and use it ourselves, but let us offer it to our neighbor, so that he may share in it, and while we help him he may help us! Lastly, such societies as this of ours and such meetings as this one are and will be great sources of help both to ourselves, our cause and our fellows.

---

**Homer Clark Bennett, M. D.**

Homer Clark Bennett, M. D., M. E., Ph. G., D. P., M. Ph., is the son of an eminent divine, the late Rev. Silas Bennett, A. M., D. D., of the Cincinnati M. E. Conference, who gave to his son a good education in the public schools; Batavia High School; Woodward High School, Cincinnati; and the Ohio Wesleyan University, Delaware, Ohio. After leaving college he had the advantage of a thoro training in a mercantile business for two years at Bellefontaine, Ohio. He spent four years, almost continuously from 1886-89 in a laboratory and medical study, and obtained medical degrees and diplomas from the

Medical Department of the University of Wooster (now Delaware), at Cleveland, Ohio, and from the Medical Department of the University of Cincinnati, the Medical College of Ohio, where he received the Dawson prize, a gold medal, for the best surgical dissection. During this time he was for five months Director of the Medical-Clinical Dispensary in Cleveland. In 1886 he located in Bellefontaine, Ohio, in partnership with his preceptor, Edwin A. Swan, M. D., M. E., one of the best diagnosticians in Ohio, stepping at once into a large and varied general practice. While here, he engaged in the specialty of diseases of the eye and refractive errors, but recognizing the value of the young science of electro-therapeutics, he took up that line of work. Feeling the need of a wider field he moved to Lima, Ohio, in 1889, where he has remained ever since, except for ten months in 1895-96, when he was superintendent of a large mineral water, bath and electric sanitarium in Indiana. His application, study, experiments, and practice have made him the inventor of many useful electrical apparatus, and his many contributions to the medical and electrical press attracted the attention of the faculty of the National College of Electro-Therapeutics of Indianapolis, Indiana, where he went for a course of instruction. He accepted a place on the faculty of that college in 1896, which position he still holds. This college, the first school of its kind ever organized, was founded in January, 1896, and has been doing an extensive correspondence teaching all over the world to nearly two thousand students at their homes, many of whom afterward came to the college for personal instruction, and who are now able specialists. When the health of the founder, Dr. William F. Howe, failed, and he was

compelled to seek another climate, the school was removed to Lima, Ohio, and Dr. Bennett was elected General Secretary and Treasurer of the College, and assumed entire charge of the correspondence and business part of the school work, and also the editorship of the College journal, "The Electro-Therapeutist," which has just closed its eighth yearly volume. Besides this extensive literary work, he gives personal instruction in general electro-therapeutics and demonstrates apparatus and technic to students. He also enjoys a remunerative practice in his specialty and has a most elaborate and extensive equipment of up-to-date electrical apparatus, much of which is of original design and construction. His many inventions and improvements in electrodes are being sold and used all over the world.

He is author, editor, and publisher of "The Electro-Therapeutic Guide," a concise and practical book on the subject for the busy doctor, and which also contains a complete electro-medical dictionary. This Guide has nearly exhausted six editions and the seventh is now being prepared. Besides the two medical degrees mentioned above, he received the regular degree of Master of Electro-Therapeutics (M. E.), from the National College of Electro-Therapeutics, when in Indianapolis, and the same as an honorary degree from the Eastern College of Electro-Therapeutics, Philadelphia. He is also a graduate (Ph. G.) of the Ohio Institute of Pharmacy, Columbus, and holds the degree of Doctor of Psychology (D. P.), from the Chicago School of Psychology.

He received the first honorary degree of Master of Physiological Therapeutics from the Cincinnati Post-Graduate School of Physiological-Therapeutics, and is consultant to that institution. He was for

several years City Physician and also Police Surgeon to the city of Lima, and member of the Board of Health.

He has compiled and published the only complete and scientific resume of the subject of electrocution, having given this subject much consideration. He is a member of the National Society of Electro-Therapeutists, and also a charter member of the American Roentgen Ray Society, and charter member of the American Electro-Medical Society, of which he was vice-president in 1904, and at the recent session, when the name was changed to that of the American Progressive Therapeutic Society, he was elected president for 1905. He has received numerous flattering offers from prominent metropolitan specialists, schools, and electrical houses to leave Lima for other points, all of which he has declined, preferring his present field of study, experiment and teaching to all others as being most congenial and conducive to careful study, good work and satisfactory results. He is well and favorably known both at home and abroad as a physician, scientist and careful business man, and is always busy in the college, journal, laboratory or office, where he has one of the most complete equipments of electrical and physiological apparatus for therapeutic work to be found in the country. He is an Odd Fellow, Good Templar, Woodman, Oriental, Khorassan, and is a prominent member of the Senate team of the famous Lima Lodge, No. 91, Knights of Pythias.

He appreciates and possesses the three great blessings, which are, to be alive at the beginning of the twentieth century, to be young, and to have splendid health, all of which offer great promise for future usefulness and honor.

## American Progressive Therapeutic Society.

President's Annual Address.\*

BY O. SHEPARD BARNUM, M. D., LOS ANGELES, CAL.

An apologetic tone has been apparent in a number of articles printed in our medical journals upon the general subject of electro-therapy. No doubt most of the readers of this page have been cognizant of it and perhaps deplore the fact as I do; and yet there has heretofore been some justification for the tendency. This justification, I believe, lies in the fact that the average medical practitioner has had his mind more or less confused by stories of successful use and fearful abuse of this therapeutic aid. There is no question but that the field has been abused. Charlatans and over-sanguine physicians have each done their part to give the science of electro-therapy a "black eye," the one governed by a thirst for greed, the other flitting from enthusiasm for, to an utter condemnation of the practice, without giving the apparatus which he so eagerly bot a thoro trial.

Is there a change of front? Most assuredly, yes. In my city, for instance, there is a flourishing electro-medical society of upward of fifty members, made up of active men of all schools (as all electro-therapeutic associations should be), and its proceedings and meetings are arousing a marked interest among the members of the profession at large. This, I believe, is typical of many cities of the country. Whether our sudden advance into the realm of light-ray therapy, or some other matters have been the cause of the present popularity of our branch of medical science or not, the

facts are that we have now a standing that was not ours five years ago.

Far from apologizing, we may feel justly proud of our field of endeavor. Both theoretically and practically we are on the right track. Some of us may be side-tracked by inanition, some off at a tangent, but the main line exists, and equipment is sufficient for a safe and rapid run.

Electricity is omnipresent, says the geologist; electricity is life, says the biologist; the electrical ion is the ultimate atom, says the scientist; electricity is matter, says Sir Oliver Lodge. Whatever it is, we know it exists in the protoplasmic cell, in vegetation, in the animal, in the fish, in the human anatomy, in the ton of hidden ore and the milligram of radium. These facts signify that the force we are using is as wonderful as it is inexplicable. Accept any definition of electricity we may, the incontrovertible facts still attend it.

To the observing medical practitioner the practical phase of the use of electricity is even more attractive and entertaining than the realm of abstract theories. To most of us the immediate amelioration of an acute neuralgia by the application of electric currents is of far more interest than the query as to whether the nerve is made up of electrical ions or not; to see and know that the x-ray will cause a dermatitis is of more moment than to speculate as to whether it may be caused by the actual bombardment of electrically charged particles, or because of an inharmonious vibration. The facts exist, tho the proper explanation may yet be a matter of disagreement.

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\*Read at the annual meeting of the American Progressive Therapeutic Society at Chicago, December 2, 1904.

Furthermore, the field is no longer one of experimentation for the electro-therapeutist. In a long catalogue of lesions, particularly of the skin, we know what the x-ray and certain currents will do. To be sure, there is still lack of knowledge of technic, but the operator of experience is able to prognose quite accurately as to the outcome of his work with the Roentgen ray. In acne, pruritus, eczema and epithelioma we feel confidence in electrical therapeutics, but I am quite convinced that more wonderful things than these are before the scientific student of our specialty. I refer to my belief that constitutional diseases will successively succumb to the power of electricity as our knowledge of it and improved methods of administration come into play. Chronic nephritis has been reported by very many operators as amenable to treatment by proper electrical applications; many afflictions of the liver and other glands give way to healthier tone under the influence of electricity; perhaps greatest of all may be the final success in pulmonary tuberculosis. Together with other operators, I have been striving for good results in this disease, and with most gratifying success. Doubtless considerable time will elapse ere we may agree on the best technic for this trouble, but it appears to be manifest that there is great value in both Roentgen ray and high-frequency currents.

Williams, in his work on "High-Frequency Currents," reports incompletely forty cases of phthisis treated by him with that form of electrical energy. Cleaves, of New York, in her very excellent work on "Light Energy," mentions a few cases treated by electric light baths and static currents. The gist of these reports was very favorable to those modalities as auxiliary means to the de-

sired end, but my experience leads me to the conclusion that a combination of x-ray and high-frequency seances will do more than the above mentioned. My records show cases in advanced stages of phthisis where the bacilli entirely and permanently disappeared from the sputum in four months, and weight began to increase at the end of the first month and continued till a cure was effected; and this under what would be styled unfavorable surroundings, i. e., poverty and lack of intelligent hygienic precautions.

We may well congratulate ourselves on such success as we are able to record as the result of proper use of electrical agents during the past years, and yet who can surmise what lies just before us? If the past decade is a criterion, the next ten years will see developments and advancements such as our most visionary enthusiasts have never dreamed. With these thoughts in mind it appears to me of paramount importance that as a body of specialists—electro-therapeutic practitioners—we should guard our ethical standing with the utmost diligence. I want to remind you that in this is included not only the flagrant commissions typical of the "quacks," but more particularly the tendency to sacrifice our future by misrepresentations now. Over-enthusiasm is suicidal. If our reports at this time are not *bona fide*, and verified by every possible means in our power, the reaction against us will be quick and sure. I have traced cases reported as cures of malignant growths, for instance, only to learn that no scientific means were used to verify the diagnosis; no microscope was used, no record of heredity secured and not even a consultant called to corroborate. We shall receive and deserve the censure of the profession if we let our enthusiasm ignore in our reports the de-

tail that the true scientist must give to insure a hearing.

The relation of the electro-therapist to the profession at large is still somewhat ambiguous. Among the general practitioners there is an appreciable sense of discomfort and antipathy because of the extravagant claims made by some operators that electricity is a panacea for the entire catalogue of human ailments. This is harmful to both the physician and the electrical specialist. The former either refuses to believe the absurd statements, classifying all medical electricians as charlatans and unworthy of recommendation to the patient, or else attempts, by some crude apparatus, to treat electrically, with almost inevitable lack of success, to the injury of the patient and harm to our branch of medical science.

To the surgeon our relation is more nearly fixed. In skiagraphy our position is well defined and secure, but in the matter of x-ray versus the knife in lesions where either may be indicated, there is (and possibly always will be) a certain amount of disagreement. In my opinion our wise course is one of compromise, at least for the present. I have continually argued and yet assert that the knife and x-ray or light-ray treatment together are better than either one alone in the vast majority of instances, the exceptions but serving to prove the rule. Old-fogy surgeons still exist who bitterly oppose the advance of light-ray therapy, and general practitioners are extant who scoff at any departure from old-time ruts in which they have traveled so long. A short time ago I listened to a paper by one of the leading members of a national electro-therapeutic association, in which great lamentation was made because the galvanic current was being relegated to the background and high-frequency com-

ing to the fore. He urged us to hie back to the love of our childhood, stigmatizing the new currents as chiefly, if not wholly and solely, spectacular. Bless his dear old-fogyish heart! Nothing this side of the grave will convince him that we have improved on our grandfathers' time. Valuable and even indispensable as I consider galvanism and faradism to be at times, I would hardly consider the statement that the modern coil currents and modifications are spectacular as an arguments against their use.

The advancement in medical electricity which so frightens the fogy discloses to us the greatest field possible for original research. The scientist delving into the mysteries of the electrical ion is but proving, theoretically, the essential importance of electrical stability in human life, which we have proven practically in our office by administering that tonic to abnormal conditions. No field for work has greater possibilities, none is more worthy of conscientious, painstaking care on the part of the doctor who desires to fulfill the duties of his calling—the benefit of humanity.

With such enormous possibilities ahead of us, our future rests entirely on ourselves as a specializing part of the greater profession.

First, we must gain the coöperation of our confreres by standing on the highest plane of medical ethics.

Second, we must conduct our work as a veritable science.

I have previously touched on both of these. The detail of the first is patent to all. Emphasis can not be too strong on the second. Our practical phase of the advance into the field of electricity must be coeval with the work of Thompson, Crookes, Lodge and others, and our deductions must be perfectly reliable, and

to be so they should be based on incontrovertible facts. Our records must bear the imprint of truth. They must be in accordance with scientific methods which comprehend a rigorous testing and re-testing of every step in the process. Our diagnoses must be beyond refute, our attention continually fixed on the minutiae,

which, after all, is the essence of all scientific reports. A careful adherence to these suggestions will, in a very few years, place our branch of therapeutics on a plane higher than it now holds—one worthy of its importance and creditable to those whose efforts put it there.



## Indexes of the Degree of Penetration of the Roentgen Rays\*

BY JOHN T. PITKIN, M. D.

Failure or success as a radiographer largely depends upon the ability of the operator to determine the degree of penetration of a given x-ray field. He who is able, therefore, to recognize this property of the x-light the moment a given tube is brou into action possesses one of the fundamental qualifications of an expert.

For purposes of study we may divide the indexes of penetration into those which require the operator to enter the x-ray field, where he is exposed to their malignant influence, and those which can be observed while he remains excluded from the field and from the untoward consequences of their cumulative action.

Under the former caption will be considered the various ways in which the fluoroscope is employed. In using this instrument it is customary for the operator to place in his hand a varying number of sheets of some dense metal such as tin-foil or other objects in front of its distal extremity, and judge by the transparency or translucency of such objects the degree of penetration of the x-light.

Under the latter heading will be considered the following indexes:

- (1) The length of spark that a given tube can back up.
- (2) The quality of work the tube has previously performed.
- (3) The appearance of the concave surface of the cathode cup.
- (4) General characteristics of a tube in full functional activity.
- (5) The strength of the magnetic field which envelops the excited tube.

Experience in the use of the fluoroscope as an index of the degree of penetration teaches us that its revelations are somewhat misleading. An x-ray field that is adapted for fluoroscopic work of a given portion of the body will not be quite strong enough to use for radiography of the same region, but if due allowance is made for a certain disparity between fluoroscopic and radiographic effects good results can be anticipated.

The dangers to the operator from the continued employment of the fluoroscope are now too well known to require more than a passing mention.

As an index of the degree of penetration of the x-rays, the length of spark

\*Read before the American Progressive Therapeutic Society at Chicago, December 2, 1904.

that the tube can back up has considerable signification.

In a general way when the spark is from nine to twelve inches in length, the rays emitted from the glass wall of the tube will have a high degree of penetration. Some allowance should be made for the strength of the generator, if it is a static machine, its speed, size, number of plates, etc.; if a coil its capacity, the voltage and amperage of the current supplied to its primary, the amount of mutual and self induction, etc. With either generator, whether spark-gaps are placed in the circuit, their length and number, the size of the tube employed and atmospheric conditions, all of which are factors having more or less modifying influence upon the length of spark that a given tube can force back across the air-gap between the discharging rods of the prime conductors.

The quality of work the tube has previously performed under known conditions is important. A record of the work previously accomplished by a given tube should be kept; this record will show when the tube has sufficiently ripened by use to do a good grade of work. It then becomes a standard tube and is to be kept near the ceiling of the room, the warmest portion of the apartment, where it will maintain, with moderate use, a nearly uniform vacuum.

The length of spark that a standard tube can back up under known conditions, its general appearance under excitation, and the number of times it can charge a small Leyden jar per minute, should be noted. Such data become useful in the calibration of tubes of unknown potency. Two or more tubes standardized for a certain region of the body, under like conditions of excitation, distance from photographic surface, quality of that surface,

thickness and density of the parts to be depicted, will always yield results similar to those previously recorded.

The appearance of the concave or cupped surface of the cathode terminal is an index to the degree of penetration of the Roentgen rays. In tubes that yield rays of a high degree of penetration this surface has a light blue central spot about the size of a silver dime, with a prismatic play of colors at the outer border of the blue in the order and of the nature of the solar spectrum. The power of penetration of rays from a given tube is proportionate to the size of the circular discoloration. In low tubes the spot is small and takes on other colors.

The general appearance of a tube which generates rays of a high degree of penetration is characteristic. Such a tube is a little hard to start into action. When first started the green or active hemisphere may flicker but soon becomes steady, well defined and uniform. It is of a dull green color. There is frequently heard a crackling or snapping sound due to sparking over the external surface, which becomes rapidly covered with dust and elementary carbon. The internal surface of the glass of the active hemisphere takes on a blue deposit; the target, when made of thin material, becomes red throughout its entire surface with a whitish red center; the cathode and the anode streams are invisible, no blue cloud hovers behind the target. Such tubes have a green radiating aurora borealis or positive aurora at the positive extremity. The magnetic field on the outside of the Crookes tube is an index to the degree of penetration of the x-light. Enveloping the Crookes tube on every side is a magnetic field of force which electrically charges all objects in the neighborhood. The strength of this field is in direct pro-

portion to the degree of penetration of the x-light, hence the electrical charge of an object at a given distance from the excited tube may be used as an index of the rays' penetration.

The object to be charged may be a small Leyden jar, a glow lamp, a small secondary Crookes tube with its negative terminal grounded or a grounded metallic plate of given dimensions. One or more such objects can be employed providing their capacity is known or can be estimated. The small Leyden jar of a given capacity at a certain distance from the excited tube is charged and discharged with a given rapidity; the glow lamp or the small Crookes tube will emit independent rays of a certain intensity; a metallic plate grounded with a spark gap in simple series will spark so many times per minute. All of these effects are intensified when the negative side of the generator is grounded. If a short piece of soft wood is placed in the spark-gap between the metallic plate and the ground wire, when the rays are very powerful, the piece of wood will be ignited.

When at a given distance one of our standard tubes of known power will cause a small Leyden jar to discharge a certain number of times per minute, another tube of unknown power of penetration must cause the same jar to discharge the same number of times per minute in order to give rays of the same degree of penetration. The relation between the frequencies of the discharges of the two

tubes is the relation between the power of penetration of the x-rays which they generate.

When the negative side of the generator is grounded and a metallic plate one foot square is placed in the magnetic field, one foot from the tube, and the entire electrical current which previously passed thru the interior of the tube is thereby diverted, so that the light becomes extinguished, such a tube can be employed to radiograph an adult hip, the lumbar spine, or shoulder. With such a tube the operator should be able to obtain pictures of quality, having perspective and rich in detail and contrast. Once the technic of radiographing the denser portions of the body has been acquired, the depicting of all other regions become comparatively simple.

Failure to obtain good pictures of the denser portions of the body usually means the employment of rays of too low a degree of penetration.

When the x-ray field has the proper degree of penetration, the duration of exposure should be proportionate to the thinness of the field, or inversely as to its density. An over exposure with rays of an extreme degree of penetration and density is much to be preferred to an under exposure, because the former can be largely controlled and overcome in the development of the latent image, while the latter is less susceptible to similar manipulation.

Buffalo, N. Y.



## American Progressive Therapeutic Society

The second annual meeting of the American Electro-Medical Society convened at the Masonic Temple, Chicago, on the afternoon of December 2, 1904. The attendance was small. The address of the retiring president, Dr. O. Shepard Barnum, Los Angeles, Cal., was read by the secretary. A number of other papers were read and referred to the Committee on Publication. Most of them will appear later in this journal.

On motion of the Executive Council, and by unanimous vote, the name of the Society was changed to THE AMERICAN PROGRESSIVE THERAPEUTIC SOCIETY. The annual dues were fixed at two dollars, and some minor changes made in the constitution to harmonize with the change of name and broader field of work of the Society.

The following officers were elected for 1905:

President—Homer C. Bennett, M. D., M. E., Lima, Ohio.

Vice-Presidents—T. Proctor Hall, Ph. D., M. D., Chicago, Ill.; O. Shepard Barnum, M. D., Los Angeles, Cal.; Otto Juettner, M. D., Cincinnati, Ohio; J. N. Scott, Kansas City, Mo.; Mihran K. Kassabian, M. D., Philadelphia, Pa.; S. D. Greenwood, M. D., Neenah, Wis.; J. Mount Bleyer, M. D., New York.

Secretary—Joseph R. Hawley, M. D., Chicago.

Treasurer—T. Proctor Hall, Chicago.

H. Preston Pratt, M. D., chairman executive committee.

Following is the amended

### CONSTITUTION.

#### ARTICLE I—NAME AND OBJECT.

Section 1. This Society shall be known as the American Progressive Therapeutic Society.

Sec. 2. The object of this Society shall

be investigation in electricity and allied sciences, embracing the whole field of progressive therapeutics, and the encouragement of their application to medicine and surgery by the formation of district and local societies.

Sec. 3. This Society shall have complete supervision over the state and district societies and shall be the court of appeals for said state and district societies.

#### ARTICLE II—EXECUTIVE COUNCIL.

Section 1. All business of this Society shall be entrusted to an Executive Council, which shall elect the officers, arrange for the annual meeting and the publication of the Society's proceedings, decide all questions of membership and any and all business of whatever nature pertaining to the interests of the Society, decide all questions on appeal from the state or district societies and report its proceedings to the Society without unnecessary delay. The Council shall elect its own chairman and such other officers and committees as it may deem necessary. The secretary of the Society shall be secretary of the Council, but this does not entitle him to a vote in the Council.

Sec. 2. The executive Council shall meet on the day before the annual meeting for the transaction of business pertaining to the Society, and again on the afternoon of the day before the final adjournment of the Society to complete all unfinished business. Special meetings shall be called by the chairman on the written request of five members. One member of the Executive Council may vote by proxy for another.

Sec. 3. The president of each state or district society which is recognized as a branch of this parent Society shall be a member of the Executive

Council, and each state president who has served for one year shall continue to be a member of the Executive Council for the four following years, if during that time he remains a member of this Society in good standing. These members, together with the president and all ex-presidents, shall constitute the Executive Council of the Society.

#### ARTICLE III—OFFICERS.

Section 1. The officers of this Society shall be a president, a vice-president from each state or district society, a secretary and a treasurer.

Sec. 2. The president, secretary and treasurer shall be elected annually by the Executive Council.

Sec. 3. The president of each state or district society shall be *ex-officio* a vice-president of this Society. The vice-presidents shall rank in the order of the organization of the state societies.

Sec. 4. The duties of these officers shall be those usually pertaining to their office.

#### ARTICLE IV—MEMBERSHIP.

Section 1. All active members of this Society or any of its branches shall be medical practitioners who are interested in the objects of the Society and licensed to practice in the State in which they reside.

Sec. 2. Persons not legally qualified medical practitioners who are interested in the objects of this Society may become associate members upon complying with the other requirements for active membership. They shall be entitled to all the privileges of membership except that they can not be members of the Executive Council.

Sec. 3. When a state society is organized every resident member of this Society shall be *de facto* a member of it, and thereafter in that state only members

of the state society in good standing can become or remain active or associate members of this Society.

Sec. 4. Persons who are distinguished for investigations in science or in the application of same to medicine or surgery may be elected to honorary membership by a two-thirds vote of the Council. Honorary members shall pay no fees, shall not be entitled to vote and can not become members of the Council.

Sec. 5. Applications for membership shall be forwarded to the Executive Council and shall be reported upon by the president of the Society of the state or district in which the applicant resides. The application shall be accompanied by the entrance fee of \$3.00, which, in case of election, shall be accepted as the dues for the next annual meeting, and in case of rejection shall be returned.

Sec. 6. Membership in any recognized medical society, together with proof of the applicant's right to practice, shall be accepted as sufficient evidence that the applicant is in good standing, and shall entitle him or her, on compliance with the other requirements of the constitution, to membership in the Society or any of its branches. The president and secretary of the local society of which he or she is a member shall sign the application blank with the applicant.

Sec. 7. No application for membership shall be rejected by the Council until the applicant has been notified of the objections against him and the persons by whom the objections are urged, and has been given an opportunity to defend himself. Any member who files against an applicant charges which he is unable to substantiate shall be deprived of all privileges of membership for one year.

Sec. 8. The annual dues shall be \$2.00, payable on the first day of the annual

meeting. Members who are more than one year in arrears in their annual dues will, after notification, be dropped from the list of members, but may be reinstated within one year from that time upon payment of their dues in full.

Sec. 9. Members guilty of immoral or unprofessional conduct may, after a hearing, be expelled from the Society by a two-thirds vote of the Executive Council.

#### ARTICLE V—ANNUAL MEETING.

Section 1. The annual meeting of this Society shall be held at such time and place as the Executive Council may determine.

Sec. 2. At the annual meeting any ten members may appeal in writing from any act or decision of the Executive Council to the Society, and a time during each annual meeting shall be set apart by the Executive Council for hearing such appeals and for the introduction of new business. The decision of a majority of the members present in regular session at such appointed time shall be binding upon the Executive Council. No new business shall be introduced to the Society at such time except in writing on the motion of ten members.

Sec. 3. Roberts' "Rules of Order" shall govern the proceedings of the Society and its branches.

#### ARTICLE VI—OFFICIAL ORGAN.

THE AMERICAN JOURNAL OF PROGRESSIVE THERAPEUTICS shall be the official organ of this Society. Each member in good standing shall be entitled to receive it without additional expense.

#### ARTICLE VII—STATE SOCIETIES.

Section 1. A state organization of this Society shall be known as the —— State Progressive Therapeutic Society.

Sec. 2. The officers of the State Society shall be a president, one vice-president

for each county society, a secretary and a treasurer.

Sec. 3. The president, secretary and treasurer of the State Society shall be elected by the State Council annually.

Sec. 4. The president of each county society shall be a vice-president of the State Society. The vice-presidents shall rank in the order of the organization of the county societies.

Sec. 5. The business of the State Society shall be entrusted to a State Council. The State Council shall consist of (a) the president of the State Society, (b) all ex-presidents of the State Society who remain members in good standing, (c) the presidents of the county societies in that State, (d) ex-presidents of the county societies who have served for one full year as county president and who remain members in good standing of the State Society shall continue to be members of the State Council for the four following years.

The secretary of the State Society shall be secretary of the Council, but this shall not entitle him to a vote in the Council.

Sec. 6. When a county society is organized, members of the State Society resident in that county are *de facto* members of it, and thereafter in that county only members of the county society in good standing can become or remain members of the State Society.

Sec. 7. The State Council shall be the court of appeals for the county societies.

Sec. 8. The membership fee for the State Society shall be \$1.00 per year.

#### ARTICLE VIII—COUNTY SOCIETIES.

Section 1. Only one county society shall be recognized in each county, but as many sections may be organized as are deemed necessary.

Sec. 2. The officers of the county society shall be a president, one or more vice-presidents, a secretary, a treasurer and such assistants as may be necessary.

Sec. 3. The presidents of the sections, if any, shall be vice-presidents of the county society. Other officers of the sections shall be assistants to the corresponding officers of the county society.

Sec. 4. The membership fee for the county society shall be \$1.00 per year, unless otherwise ordered by the society.

Sec. 5. Rejected applicants for mem-

bership and members suspended or expelled may appeal to the State Council.

#### ARTICLE IX—AMENDMENTS.

This constitution may be amended at any annual meeting by a two-thirds vote of the members present, provided such proposed amendment is signed by ten members and is in the hands of the secretary of the Council one day before its annual meeting. If the proposed amendment is approved by the Council it may be adopted by a majority vote of the Society.



## Music as a Therapeutic Agent\*

BY FRANCIS S. KENNEDY, M. D.

BROOKLYN, N. Y.

It is not my intention to, nor does time permit that I should, go into the subject of "Music as a Therapeutic Agent," with the object of dissecting musical composition, nor of demonstrating the niceties of counter-point, fugue, and harmony, but rather to take music as we find it, and to see wherein it meets the requirements of the physician in treating certain classes of patients.

From the great array of drugs, we select such remedies as we know will prove of service in meeting a given class of symptoms; not alone is the proper drug selected, but careful direction is given as to its preparation and the method of administration. The physician who would go into the sick room and say: "This patient requires drugs; send out and get a quantity, then administer freely," would be a fit subject for treatment himself. Fortunately for our pur-

pose, music is not a new thing, but has been in existence since the beginning of time; while its variety, color, strength, source, and application are as great as the drugs of the pharmacopeia.

Musicians and composers have rivaled the chemists and pharmacists in the making of new combinations and the producing of new effects. The one produces symphonies, operas, and folk-songs; the other provides tinctures, fluid extracts, and powders; yet the therapist can find in both groups the tonic, the stimulant, the sedative, and the narcotic.

The chemist announces the discovery of a new drug and offers it for consideration and trial. He finds that five grains have killed a dog, while two grains have produced sleep in a guinea pig. It is therefore suggested that initial doses should not exceed a quarter of a grain, and that it could be tried in cases of insomnia, a close watch being kept on the heart action. The musician announces a new slumber song, quiet, soothing,

\*Read before the Medical Society of the County of Kings (N. Y.), May 23, 1904, and published in the *Medical Record*.

without danger to life, and capable of producing restful sleep. His production was not the result of an accident, for before a single note or chord was written, he knew what effect he desired to produce on the listener, and his whole endeavor was to that end.

Music has an unquestioned and positive action on the mind and body which can not be doubted. Dogiel finds, in his "Experiments Upon Men and Animals," that music, according to its nature, will either increase or decrease blood pressure, the extent being governed by the character of the music and the personal susceptibility of the individual. He also finds the pulse rate is retarded or accelerated under the same conditions, and that the respiratory rhythm is modified in direct proportion to the pulse rate. Dr. Herbert Lilly, in his pamphlet on the "Therapeutics of Music," argues that musical sounds being received by the auditory nerve produce reflex action upon the sympathetic system, stimulating or depressing the vasomotor nerves and thus influencing the nutrition of the body.

By what channels and by what processes the sympathetic system and the emotions are affected when musical harmonies reach the ear mechanism, does not concern us at this time; these points were elaborately considered some five years ago by Dr. J. Leonard Corning, of New York, and his conclusions published at that time in the *Medical Record*. The fact remains, however, that certain mental conditions are benefited by suitable musical harmonies, and that muscle fatigue is overcome or forgotten by the production of stimulating music, and that even the complex process of digestion is benefited by appropriate music—the kind which the French call "liver music," and furnished by them at banquets.

The whole purpose of music is to produce impressions, and thereby affect the emotions. So true is this in its workings that the same effect is produced on the child and upon the adult of education; upon the white man and the savage; upon the human being and upon the lower animals. The soldier upon the march forgets his weary muscles as the band sounds an enlivening piece of music of fixed measure. His head is held a little higher, his back becomes a little straighter, while the length of his step is increased an inch or so and is more elastic. The running athlete is lifted over the ground in better time when aided by a brisk quick-step, for he feels the inspiration in every muscle. No one could dance to either a slumber song or a nocturne, nor would an infant pass over into dreamland in the presence of a brisk march or waltz.

Back in the early years of this century, when the Moravian settlement at Bethlehem, Pa., was but an infant in years, when the surrounding country was a wilderness, with hostile Indians at every hand, a sentinel from the settlement rested wearily upon the hillside, which sloped toward the river below. His eyes were to the front, watching for the first signs of an expected Indian attack; his heart and thoughts were back in his little crude home, where a loved one was dangerously near the great divide. Slowly an Indian crossed the river and noiselessly began to climb the hillside toward the settlement. He was the first of a long, sinuous line. His alert watchfulness soon discovered the white settler. His arrow was ready, his bow drawn, but a second more and a swift, silent messenger of death would have flown to its mark. Suddenly, through the soft evening air, from the heights above, came the full,

clear tones of a trombone choir, in solemn, dirge-like splendor, announcing the death of one of the settlers.\* Slowly the arrow was lowered, slowly the bow-string was relaxed, softly the Indian warrior retraced his steps, saying to his followers: "The Great Spirit speaks in soft sounds and without anger. The Great Spirit says Peace." The settler knew by the tones of the anthem that the loved one had passed away, and with bowed head he murmured: "Thy will be done." The music which told the white man of sorrow brought a spirit of forgiveness to the savage.

Music always reaches the sub-conscious part of our mysterious mechanism; it affects the subjective mind, swaying it one way or another, and leading it unconsciously, as if by inspiration, in whatever channel of thought the character of the music compels. Nearly every one is peculiarly susceptible, often unconsciously so, to some special piece or class of music which appeals to him under certain circumstances; he may also have an equal degree of intolerance for other kinds.

Just as we avoid quinine with one patient and iron with another, while in some other cases the minimum dose will act like a charm, so it is with music. The ragtime or even a bit of opera would be unattractive or repulsive to some, while a rich melody from the South or an old familiar home song would prove interesting at once, and restful.

To consider in detail the particular kind or class of music which would be

specially suited to each of the many kinds of cases would not be possible in the limited time at our disposal, for its field of action reaches into all departments of medicine, including surgery and dentistry.

Do not imagine for a moment that I wish to convey the idea that a Chopin nocturne would amputate a leg, but it would, as a post-operative measure, have an undoubted influence for good in taking the patient's mind from his bodily distress. So, also, could "painless" dentistry be relieved of some of its pain and distress by the quieting influence of music, which would, as has been amply demonstrated, produce a pleasanter mental influence during the administration of nitrous oxide or other anesthetic.

A German writer has recently stated (February, 1904) that in a number of test cases in which music was provided during the administration of the anesthetic, there was an absence of distress and resistance on the part of the patient; also an absence or reduction of the post-operative nausea under the same circumstances.

Melancholia, insomnia, hysteria, family affliction, business reverses, delirium, pain, fatigue (mental or physical), will all be helped by the beneficial influence of music, rightly used. The general practitioner advises hydrotherapy, electrotherapy, heat, cold, light, and darkness, because they have a marked influence upon the body and mind. The threat of cold water in hysteria has a mental influence, and the tired physician himself goes to a concert for rest.

Music, like any other remedy, to be of service as medicine, must be suited to the particular needs of the individual, free from antagonizing elements, and administered in such a manner as to produce benefit.

\*It is an old-established custom at Bethlehem that when a death occurs in the Moravian congregation, the fact is announced by the trombone choir from the church belfry, the character of the anthem designating the class and condition of the deceased—whether old, young, male, female, married or single. This custom is said to have prevented a massacre, as above noted.

Music will not do everything, nor will it always be tolerated by the patient—neither will drugs, surgery, or the electric current.

The problem presenting itself to the physician, therefore, is not as to the supply, quality or efficiency of music as a remedy, but purely as to the selection of the proper kind and its administration. The majority of medical men and women know more about music than they do of electricity, and more of surgery than of either; yet the surgeon and the electro-therapeutist, both as consultants and specialists, are recognized as a necessity. We have medical men who are musicians, and many able musicians who would be valuable consultants as to theme and method of administration. These factors would differ, to a degree, with every patient. The organ, the violin, the 'cello, and the harp are all available as means of producing proper music, but, in each instance the execution must be smooth, expressive, and free from error. The piano is found in the majority of homes and institutions, and is always available.

There can be but little doubt that many of our trained nurses would be found capable performers upon the piano, and also to possess voices of suitable quality; if so, they could make themselves of double value. The quality of voice and the ability to sing or play should be judged, however, by some one other than the owner or performer.

In this connection, it may be of interest to note the work which the St. Cecilia Guild of London is endeavoring to do, according to their prospectus:

They desire (1) to institute a series of investigations to determine the extent of influence which music has upon the heart, blood-pressure and respiration. (2) To train a corps of special musicians,

both vocal and instrumental, who would be expected to respond at any hour of the day or night to the calls of physicians or institutions, and who would be particularly competent to either sing or play such style of music as might be required. (3) To establish in some central hall or building a continuous performance of music, this to be transmitted by telephone direct to the bedside or room of the patient whenever required.

NOTE.—Following the reading of the paper, two methods of administration were demonstrated, one by the piano and the other by the voice, and an endeavor made by each method to illustrate the different impressions which could be conveyed to the listener. Just as a drug should be put up in a clean package and as free from adulteration as possible, so music as a medicine should be as free from error of technique as possible. For this reason, in demonstrating the piano music, a mechanical pianoplayer was used so that no false note should mar the harmony and effect. The following examples were then rendered: As restful music yet sufficiently stimulating to keep the mind alert, "The Fifth Nocturne," Leybach, piano. As soothing, quieting music, "An Irish Lullaby," Needham, contralto. As physically stimulating music, "The Invitation to the Dance," von Weber, piano. As mentally stimulating music, "One Spring Morning" (Goethe). Nevin, contralto. As reminiscent, memory-refreshing music, "Fantasie from Il Trovatore," Sydney Smith, piano.

462 Greene avenue.

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August W. Ball is the inventor of a process for curing and preserving meats. The improved process consists essentially in employing an electric current in such manner that the preservative solution shall constitute an electrolytic bath and the article to be cured shall constitute the cathode, so that the bath shall be subjected to the decomposing action of the current and the entire current caused to pass thruout all parts of the meat, thereby causing the preservative ingredients to be thoroly and uniformly deposited thruout the meat.

**Some Difficulties in Getting On.**

Swinburne, in an address delivered to the students of the British Inst. Elec. Eng., said: The first difficulty is that nobody knows in advance what is going to be his work. A young man has probably the vaguest idea of what his life work will be, and that idea time will show to be quite wrong. Probably each man should have a general knowledge of applied physics and chemistry and mathematics, and a special knowledge of one or two subjects. "The special knowledge may never come in useful, but the chances are that in the blind stumblings which we call our careers a specialty may be very valuable." One of the great difficulties is to keep knowledge in a polished state ready for immediate use. In practice it may have to lie idle for long periods and then be wanted very much on short notice. The great thing is to master a certain number of broad fundamental principles which give a starting point for refreshing old knowledge or acquiring new. "One of the greatest difficulties in getting on arises from the idea, which is carefully fostered among English science teachers, that there is something degrading in applying science, and that business ability is an inferior quality which is to be despised." If teachers for colleges are chosen from the students who have been taught there, there is "an unavoidable tendency for education to become more and more unpractical. Ordinary school education is entirely and hopelessly useless. \* \* \* The only possible use of the present day public school and university training is to make more schoolmasters. A man who does well at school and college is fit to be a schoolmaster or clergyman and nothing else. He may do other things in spite of it, especially as his competitors are equally

badly off, but that is all that can be said." Mr. Swinburne earnestly urged any of his hearers who have the idea that there is something noble and superior about "raw science," or who thinks little of business men, to get rid of all such notions if he hopes ever to get on. "If you look round the electrical industry, or round the industries generally, who are at the top? Always the business men. The men at the head of large industries generally know very little science. A man may run a large electrical industry with the most vague ideas as to the true relation of the electrostatic and electromagnetic systems of units; in fact, he may think power, force and energy are very much the same kind of thing, if looked at in a broad, common sense way without any scientific prejudice. If he wants good technologists he employs them. If he wants practical men who can take commercial responsibility he pays good salaries; if he wants men full of book knowledge he pays low salaries, but he does not generally want them. \* \* \* The business man at the top, the practical engineer in the middle, and the unpractical engineer, or the raw scientists at the bottom." A man's value to the world at large may generally be roughly estimated by the income he earns. The business man comes out far away above the engineer. He employs the engineer; the scientific man is his servant. Mr. Swinburne does not deny that textbook science is of priceless value; of course it is; and the more scientific knowledge the leading engineers have, the better; but most suffer from too little common sense in proportion to scientific knowledge. "Schoolmasters naturally have the idea that what they are good at is most important, so a huge convention is set up. The value of what is called learning, cul-

ture, education or more often knowledge, is purely a convention with no foundation in fact. What is generally known as a learned man or scholar has only a memory full of interesting but useless items gathered from the scrap heap of the past." Mr. Swinburne then says that while in general a man's earnings are a rough test of his value to the world, a great exception must be made in the case of genius. A genius does not work for a given employer; he works for the world at large; and the world at large does not pay him. "It would be ludicrous nonsense to say that the value of Newton or Faraday could be reckoned in terms of their pecuniary earnings. They did grand work apparently because they were impelled to do it without any selfish motives. This is true of the great scientific men of today." The definition of an engineer as a man directing the great sources of power in nature for the uses and convenience of man, is considered to be bad, and to be really the definition of a scientific man. "It is incomplete as applied to an engineer, because it does not take into account the sordid element of price. An American definition is much better: 'An engineer is a man who can do for one dollar what any fool can do for two.' This is not poetical, and is useless for oratorical purposes, but it is right." Every design, every engineering manufacture, and every piece of engineering is only a question of price. One of the greatest difficulties in getting on is the poetic idea, that there is something degrading or deteriorating in taking a money view of everything. "You may say, 'We take higher views of life than that; there is something better for us in our careers than money grubbing.' So

there is; I heartily agree with you; and when you have grubbed some money and are at liberty to attend to higher things, I would like to be allowed to join you." Money is nothing in itself, it is only a means, and making it is merely a way of going ahead of your fellows. "Business is really a higher title than profession." Mr. Swinburne points out that openings in electrical engineering are scarce at present in England for young men. Income for a young man is very little criterion of real value. A hard struggle is very good for a young man who has anything in him. It gets him in the way of overcoming difficulties, so that when he gets above the small obstacles he goes on overcoming difficulties, so that when he gets above the small obstacles he goes on overcoming large ones from the mere force of habit. Nearly all great men rise from almost nothing with infinite trouble in their youth.—*Lond. Elec.*, November 18.

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#### The Life History of Radium.

Assuming that uranium breaks down to form radium, and assuming as an approximation that from one thousand kilograms of uranium the yield of radium, under most favorable conditions, would be one decigram, this, at the rate of decay of radium, would produce one-tenth milligram of substances of less atomic weight per year. In other words the uranium breaks down at the rate of  $1/10^{10}$  part of its mass per year, and its average life is ten thousand million years. On these assumptions, an interval of time is indicated which may be considered as a minor limit to the antiquity of matter in our part of the universe.—*Electrical Review*.

## Harmonic Telegraph\*

BY PROF. FERDINANDO LORI, UNIVERSITY OF PADUA.

The interesting phenomena of electromagnetic and electromechanical resonance in alternating-current circuits are well known. These phenomena, which chiefly depend upon frequency, take place when this factor reaches a certain value; and, therefore, this gives us a method of measuring frequency. If the e. m. f. acting on the circuit has a complex form resulting from the algebraic sum of several harmonics, each of them having a sinusoidal form, a method can be derived for ascertaining the existence of any given harmonic.

Let us assume a complex e. m. f. resulting from several harmonics, each of which can at will be included or excluded from a circuit at fixed intervals. Then the resonance phenomena may be employed to determine when each harmonic is acting; and, if these time intervals follow a fixed law (like that of the Morse alphabet), we will be able to transmit simultaneously on the same line as many telegrams as we have harmonics at our disposal.

A multiple transmission system based on this principle has been devised and tried by the author. The results of the experiments I have thus far made in order to ascertain the practicability of the system have been so satisfactory as to induce me to beg the honor of briefly calling your attention to the matter.

The transmitting station includes several transformers, whose secondary circuits are all connected in series with each other and with the line, while the primaries are separately supplied with alternating e. m. f., as nearly as possible of

sinusoidal form, quite independent of each other and of different frequencies. The currents can be generated by means of special alternators or by means of microphones excited by playing before their mouthpieces organ pipes of proper length. In the circuit of every e. m. f. a switch is inserted to be manipulated as an ordinary Morse key, to send the signals corresponding to that frequency. The receiving apparatus is also connected in series with each other and with the line in the receiving station.

Each receiving apparatus includes a wire stretched between the poles of a permanent magnet, the tension of which wire can be varied by means of a micrometer screw and regulated so as to make the vibrational period of the wire coincide with the frequency of one of the generators. Under such conditions, and when the e. m. f. of the generator is acting on the circuit, the wire vibrates; and if it is small enough, no sensible disturbance by phenomena from inertia takes place, the vibrations practically beginning with and being simultaneous with the action of the e. m. f.

Perpendicularly to the vibrating wire is placed a thin and rigid rod (for instance a small glass tube); one extremity of the rod is fixed and a point of it is connected with the vibrating wire. Consequently, when the wire vibrates the rod also comes into vibration, and the free extremity can be employed to write its own oscillations on a recording cylinder, after the manner of a recording tuning fork. The receiving apparatus is sensible to very small currents, under 1-20,000 of an ampere. The vibrating wire is of phosphor bronze, about twenty cm. in length, with a diameter of about 1-20 mm.

\*Read before Section G at the International Electrical Congress of St. Louis, 1904.

## Electrochemical Series of the Metals\*

BY PROF. LOUIS KAHLENBERG, UNIVERSITY OF WISCONSIN.

The current conception of the electrochemical series of the metals is the arrangement of the latter in a series so that any metal will be electropositive to all that follow it, and electronegative to all that precede it; and that any member of the series will chemically replace all the metals that follow it, and in turn be replaced by those that precede it in the series. In seeking combinations of metals that would produce the highest electromotive forces, Volta discovered the possibility of arranging metals in an electrochemical series; though, as pointed out by Ostwald in his history of electrochemistry, he did not at first realize that he had thus discovered a fundamental property of the metals.

Since the time of Volta the electrochemical series of the metals has figured with more or less prominence in all treatises on chemistry and electrochemistry. The position of the metals in the series is determined by their replacing power, but particularly by the difference of potential existing between the metals in contact with each other, or better, in contact with an electrolyte. The electrolyte usually employed is a solution of some salt or acid in water. It has long been known that the character of the acid or salt and the strength of the solution used exert an influence upon the difference of potential between the metal and the solution. This point is well discussed by Jahn in the opening pages of his treatise on electrochemistry. Nevertheless, the general feeling with regard to the electro-chemical series at present is that it really represents a fundamental property of the me-

tals, and that, tho the character of the electrolyte into which the metals are dipped when the electromotive forces are measured, affects the electrochemical series somewhat, such effects are but slight, and the order of the metals in the series remains essentially the same in all cases.

This view has no doubt been strengthened by the theory of Nernst, according to which each metal is endowed with an electrolytic solution tension, an inherent property of the metal tending to drive it into the solution into which the metal dips, and which varies only with the nature of the solvent employed in forming the solution. The theory of Nernst postulates the theory of electrolytic dissociation, and it is conceived that that which operates against the hypothetical solution tension of the metal is the so-called osmotic pressure of the simple ions of that particular metal in the solution. On the basis of this view it would naturally be expected that the difference of potential between a metal and a solution of its salt would always be the same, no matter what other things might be contained in the solution, or what solvent might be used, as long as the concentration of the ions of the particular metal in question remained constant. A few preliminary experiments made by Jones,<sup>1</sup> however, soon showed that it was necessary to assume that the electrolytic solution tension of a metal varies with the nature of the solvent.

During the last six years the differences of potential between metals and solutions, particularly such solutions in which water is not used as a solvent, have been one of

\*Read before Section C of the International Electrical Congress at St. Louis, 1904.

1. *Zeit. Physik. Chem.* 14, 346, (1894).

the subjects of study in my laboratory.<sup>2</sup> In the course of these investigations, there were employed, besides carbon, twenty different metals as electrodes; thirty-five different solvents were used in making up the solutions; and fifteen different salts were employed as solutes. The metals serving as electrodes included all of those in common use, while the solvents and solutes selected, as far as possible, typical substances. In the selection of the solvents and solutes, the questions of securing sufficient solubility and electrolytic conductivity necessarily influenced the choice very greatly.

The outcome of all this work is the establishment of the fact that at a fixed temperature the difference of potential between a metal and an electrolyte depends upon the character of the metal and upon the composition of the electrolyte. Not only does the character of the solvent affect this difference of potential, or, if the theory of Nernst and the theory of electrolytic dissociation be assumed, not only does the osmotic pressure of the simple ions of the metal in the solution and the so-called electrolytic solution tension of the metal determine the difference of potential, but *every* ingredient used in making up the solution affects this difference of potential to some extent, and frequently very materially indeed. Nor would the assumption of so-called complex ions, or of an influence which the solutes might have on the concentration of the ions of the metal in question (for which assumptions there would moreover frequently be no grounds) enable one to escape from the conclusion that the electrolytic solution tension of a metal is influenced not only by the solvent but

also by the solute. But if the electrolytic solution tension of a metal is determined by the character of the solvent and also by that of the solute, it is plainly evident that this quantity, which is viewed by Nernst as an inherent property of the metal itself, is in reality as much a function of all the ingredients in the electrolyte as of the metal. In this connection it is of fundamental importance to bear in mind a further result of the investigations carried on here, namely, that the change which the difference of potential between a metal and the surrounding solution undergoes when any constituent of the solution is altered, is in general different, either as to magnitude or direction, or both, for different metals toward the same solution.

The facts established experimentally in these researches point to the conclusion that the difference of potential between a metal and an electrolyte into which the metal dips is due to the mutual chemical interaction of electrode and electrolyte. On the basis of this view the facts at hand can readily be explained. It becomes clear at once why a change on any ingredients of the electrolyte should affect the e. m. f. developed, and why in the case of different metals this effect should be different as to magnitude or sign, or both, for one and the same change in the electrolyte. At first thought it might seem that this view of ascribing the e. m. f. developed at the junction between a metal and an electrolyte to the chemical affinity, or strain tending toward interaction, existing between the metal and the electrolyte, would not enable one to detect regularities existing in the phenomena of the electromotive forces that have actually been measured, but this is a delusion. Similar metals behave similarly in the development of potential differences toward an

2. Compare *Jour. Phys. Chem.* 3, 379 (1899); *Ibid.*, 4, 709 (1900); also *Trans. Amer. Electrochem. Soc.* 2, 89 (1902).

electrolyte, and similar ingredients introduced into an electrolyte produce similar effects toward one and the same metal in the development of potential differences. Bearing this in mind enables one to detect much of regularity in the electromotive forces measured.

As a striking instance of how the difference of potential between a metal and an electrolyte changes when one of the ingredients of the electrolyte is gradually altered, the following illustration may be given. The e. m. f. of the chain:  $\text{Ag} | \frac{N}{10} \text{AgNO}_3$  in Pyridine\*  $| \frac{N}{10} \text{AgNO}_3$  in Water  $|\text{Ag}$ , is 0.422 volts at 20° C., the silver dipping in the aqueous solution being the positive pole of the combination. When in the first half of the chain pyridine is gradually replaced by water, keeping the solution one-tenth normal for  $\text{AgNO}_3$  and allowing everything else in the chain to remain unchanged, the e. m. f. of the combination varies as indicated in Table 1. The first column shows the composition of the electrolyte of the first half of the chain by indicating the number of volumes of one-tenth normal  $\text{AgNO}_3$  in water used to one volume of one-tenth normal  $\text{AgNO}_3$  in pyridine; and the second column gives the e. m. f. found. The silver dipping in the one-tenth normal  $\text{AgNO}_3$  solution in water remains the positive pole throughout.

TABLE 1.<sup>3</sup>

Volumes of water.	E.M.F. in volts.
0.00	0.422
0.33	0.376
1.	0.339
3.	0.300
7.	0.259
15.	0.210
32.	0.148
64.	0.055

3. This table is taken from one of the papers cited above, *Jour. Phys. Chem.* 3, 279 (1889).

127.	0.022
255.	0.013
511.	0.011

During the past year I have had Mr. J. P. Magnusson, fellow in chemistry at this university, measure the differences of potential between various metals dipping in a one-tenth normal solution of lithium chlorid. The solvents used in making up these one-tenth normal lithium chlorid solutions were pure pyridine, pure water, and mixtures of pyridine and water in various proportions. Great care was used to have all the materials employed of a high degree of purity, and to have the surfaces of the metals free from contamination. In each case the chain measured was of the form, Metal  $| \frac{N}{10} \text{LiCl}$  in pyridine, water, or pyridine+water  $| \frac{N}{10} \text{AgNO}_3$  in pyridine  $|\text{Ag}$ . The second half of the chain always remained unchanged; and for the value of this half of the combination I had previously found<sup>4</sup>—0.573 volt,<sup>5</sup> on the assumption that the half cell,  $-n\text{KCl}-\text{HgCl} | \text{Hg}$  is equal to —0.56 volt.

In Tables 2 to 6, which follow, the metal in the first half of the chain is indicated in the first column; in the second column is given the total e. m. f. of the chain indicated at the head of the table; and in the third column is given the difference of potential of the first half of the combination referred to the value —0.56 volt for the normal calomel electrode. In computing the values in the third column, careful attention was paid to the sign.

\*The symbol *N* indicates a chemically *normal* solution, or for silver nitrate, 170 grams (the *N* molecular weight) in one liter. — means a solution containing one-tenth of this amount.

4. *Jour. Phys. Chem.* 3, 379 (1899).

5. This value was fully confirmed by Mr. Magnusson.

TABLE 2.

Chain: Metal |  $\frac{N}{10}$  LiCl in pyridine |  $\frac{N}{10}$  AgNO<sub>3</sub> in pyridine | Ag.

Metal.	Total E.M.F.	E.M.F. of 1st half.
1 Mg	1.211 volts	+0.638 volts
2 Zn	1.043 volts	+0.470 volts
3 Cd	0.966 volts	+0.393 volts
4 Mn	0.808 volts	+0.235 volts
5 Al	0.705 volts	+0.132 volts
6 Pb	0.663 volts	+0.090 volts
7 Sn	0.618 volts	+0.044 volts
8 Cu	0.595 volts	+0.022 volts
9 Co	0.548 volts	-0.025 volts
10 Ni	0.444 volts	-0.129 volts
11 Sb	0.438 volts	-0.135 volts
12 Bi	0.423 volts	-0.148 volts
13 Hg	0.411 volts	-0.162 volts
14 Ag	0.398 volts	-0.175 volts
15 Cr	0.387 volts	-0.187 volts
16 Au	0.309 volts	-0.264 volts
17 Fe	0.288 volts	-0.285 volts
18 Pd	0.251 volts	-0.322 volts
19 Pt	0.199 volts	-0.374 volts
20 C	0.154 volts	-0.727 volts

TABLE 3.\*

Chain: Metal |  $\frac{N}{10}$  LiCl in 1 vol. water  
+ 3 vols. pyridine | AgNO<sub>3</sub> in pyridine  
| Ag.

TABLE 4.

Chain: Metal |  $\frac{N}{10}$  LiCl in 1 vol. water  
+ 1 vol. pyridine |  $\frac{N}{10}$  AgNO<sub>3</sub> in pyridine  
| Ag.

TABLE 5.

Chain: Metal |  $\frac{N}{10}$  LiCl in 3 vols. water  
+ 1 vol. pyridine |  $\frac{N}{10}$  AgNO<sub>3</sub> in pyridine  
| Ag.

TABLE 6.

Chain: Metal |  $\frac{N}{10}$  LiCl in water |  $\frac{N}{10}$   
AgNO<sub>3</sub> in pyridine | Ag.

To facilitate comparison, the values in the third columns of Tables 2 to 6 are gathered together in Table 7, the headings

\*The details of tables 3, 4, 5, 6 are here omitted.—En.

of the columns of the latter table indicating the composition of the solvent used.

TABLE 7.

The electrolyte was  $\frac{N}{10}$  LiCl, the solvent used being indicated by the heading of each column.

Pyridine.	1 vol. water plus 3 vol. pyridine.	1 vol. water plus 1 vol. pyridine.	3 vol. water plus 1 vol. pyridine.	Water.
Mg +0.638	Mg +1.124	Mg +1.096	Mg +1.089	Mg +1.099
Zn +0.470	Zn +0.671	Zn +0.671	Zn +0.639	Zn +0.579
Cd +0.399	Mn +0.496	Mn +0.555	Zn +0.615	Zn +0.538
Mn +0.235	Al +0.321	Al +0.281	Al +0.255	Cd +0.209
Al +0.132	Pb +0.077	Pb +0.125	Cd +0.173	Al +0.204
Pb +0.060	Cd +0.064	Cd +0.086	Pb +0.096	Pb +0.124
Sn +0.044	Cu +0.050	Co +0.014	Co +0.025	Fe +0.020
Cu +0.022	Cu -0.031	Cu -0.045	Co -0.088	Co +0.128
Co +0.025	Sn -0.087	Sn -0.144	Sn -0.137	Sn +0.170
Ni +0.123	Fe +0.174	Fe +0.162	Fe +0.156	Bi +0.300
Sb -0.135	Sb +0.180	Sb +0.204	Sb +0.257	Sb +0.302
Bi -0.148	Ni +0.208	Ni +0.237	Ni +0.257	Cu +0.345
Hg +0.062	Bi +0.208	Bi +0.235	Bi +0.276	Ni +0.384
Ag +0.173	Hg +0.379	Hg +0.467	Cr +0.491	Ag +0.442
Cr +0.187	Ag +0.404	Cr +0.467	Ag +0.498	Cr +0.508
An +0.284	Pt +0.417	Pt +0.499	Hg +0.517	Pd +0.564
Fe +0.285	Cr +0.448	Ag +0.506	Pt +0.567	Hg +0.598
Pd +0.322	Pd +0.454	An +0.567	Pd +0.567	Pt +0.611
Pt +0.374	An +0.472	Pd +0.585	An +0.588	An +0.627
C +0.727	C +0.692	C +0.694	C +0.648	C +0.640

In order to compare these results with those of Neumann,<sup>6</sup> who measured the differences of potential between metals and aqueous solutions of their salts, the values he found are given in Table 8:

TABLE 8.<sup>7</sup> Volts.

Magnesium .....	+ 1.231
Aluminum .....	+ 1.015
Manganese .....	+ 0.824
Zinc .....	+ 0.503
Cadmium .....	+ 0.174
Iron .....	+ 0.087
Cobalt .....	- 0.015
Nickel .....	- 0.020
Lead .....	- 0.095
Bismuth .....	- 0.315
Antimony .....	- 0.376
Tin .....	- 0.085
Copper .....	- 0.515

6. *Zeit. Physik. Chem.* 14, 229 (1894).

7. This table is taken from Neumann's paper, *Zeit. Physik. Chem.* 14, 229 (1894). The values recorded were obtained with the solutions of the chlorids of the metals except in the case of Cu, Hg and Ag, where the sulfates were used. The solutions of the chlorids of Bi, Sb and Sn contained excess of acid.

Mercury .....	— 0.980
Silver .....	— 0.974
Palladium .....	— 1.066
Platinum .....	— 1.140
Gold .....	— 1.356

Comparing the values in the first column of Table 7 with those in Table 8 it appears that the one-tenth normal lithium chlorid solution in pyridine is less positive toward Mg, Mn, Al, Co, Ni, and Fe than are the aqueous solutions of salts of these metals, whereas for all the other metals the reverse is the case. In column 5, Table 7, the values for Mg, Mn, Al, Fe, Co and Ni show that toward these metals the one-tenth normal lithium chlorid solution in water is less positive than are the aqueous solutions of their salts (compare Table 8), whereas the reverse is true of the other metals. And again, when columns 2 to 4, Table 7, are compared with Table 8 the same will be observed for the metals just mentioned. Bearing in mind that the lithium chlorid content of the solutions in Table 7 remains constant and that these lithium chlorid solutions are more positive toward the metals just mentioned and less so toward the other metals, than are the solutions of the salts of the metals toward the latter (Table 8), it seems natural to conclude that the effect noted is due largely to the substitution of the lithium chlorid for the salts of the metals.

A comparison of columns 1 and 5, Table 7, shows clearly the striking effect which a substitution of pyridine for water produces on the electrochemical series, and also on the absolute values of the potentials. The intermediate columns 2 to 4 show by what gradations the values of column 1 pass into those of column 5. These effects are different for different metals.

It is interesting to note in Table 7 that

magnesium maintains itself at the head of the series thruout and carbon remains at the foot, while the other metals suffer great displacements in some cases, and lesser ones in others. The absolute values of the potentials in columns 1 and 5 in Table 7 are in general quite different. In the pyridine solution the potentials are distributed over a smaller range, +0.638 for Mg and —0.374 for Pt or a total difference of 1.012; while in the aqueous solution the difference is +1.093 for Mg and —0.611 for Pt, or a difference of 1.704, being a very material difference indeed.

Toward the noble metals the pyridine solution is more positive than the aqueous solution (compare columns 1 and 5, Table 7). This is on the whole what one would expect considering what is known concerning the affinity which these metals have for the elements of water on the one hand, and for pyridine on the other. Perhaps the most notable displacement of any metal in the series is that of iron. In column 1, Table 7, it stands below gold, whereas in column 5 it is next to lead. A solution of silver nitrate in pyridine may be boiled in contact with iron without precipitating the silver or even tarnishing the iron. This is quite in harmony with the electromotive behavior.

The difference of potential between a metal and a solution may then vary very greatly with a change in the solute as well as with a change in the solvent; and since this variation differs in the case of different metals for one and the same change in the electrolyte, either as to direction or magnitude, or both, the electrochemical series of the metals is frequently subject to relatively very considerable variations, and must not be regarded as something even fairly constant. The work of earlier experimenters, such as Fechner, de la

Rive, Faraday and Wheatstone, and in more recent years the measurements of Sylvanus P. Thompson, all of which were made with aqueous solutions, serve to illustrate and to emphasize the same fact. A clear recognition of these changes in the electrochemical series is of great importance in electrochemical practice, particularly in the electrolytic separation of the metals.

A further detailed study of the differences of potential between metals and electrolytes from the standpoint of the chemical affinity existing between the metal and the electrolyte as the determining factor is being made in this laboratory; for tho—since Faraday's law holds for all electrolytes as far as known as present—the difference of potential between a metal and an electrolyte is recognized as a measure of the chemical affinity existing between them, the electromotive forces have not been foreshadowed from the affinities involved. The Helmholtz-Gibbs formula, to be sure, enables one to calculate the electromotive force of a cell from a knowledge of its temperature coefficient and of the thermal changes which accompany the chemical reaction that takes place in the cell when the circuit is closed.

**A Peculiar Telephone Accident.**—An Indianapolis correspondent refers to a curious accident which caused the partial paralysis of James Adams, of that city. Mr. Adams is a subscriber to the services of the Central Union and the New Telephone Companies, the instruments of both standing close together on his desk. He called for a subscriber on the New instrument and while waiting for the answer, with the receiver at his ear, rested his chin on the top of the Central Union instrument. He received a shock which rendered him unconscious and he fell to the floor paralyzed from his waist down. He is expected to recover, altho life was despaired of for a time. Telephone men state that they never heard of an accident like it, and give as a possible reason for such a result that Mr. Adams' nervous system must have been in a peculiarly sensitive condition to be so affected. The ordinary telephone current is not sufficient to harm any one. Opponents of dual telephone service may find in this accident an argument in support of their contention rather out of the common.—*El. World and Eng.*



## On the Electrical Purification of Drinking Water \*

BY PROF. JOHN W. LANGLEY, CASE SCHOOL OF APPLIED SCIENCE.

This paper deals with the sanitary purification of water for domestic purposes.

Attempts to destroy bacteria by the direct action of electric charges did not result in any marked success. Milk was the fluid used and static charges as high as 150,000 volts from condensers of one-seventh of a microfarad capacity, were sent through twenty cubic cm. in sterilized vessels, but the milk so treated soured only six hours later than a sample of the same milk not electrolyzed.

Substantially the same results followed the application of alternating currents of 500 volts having a frequency of sixty-six cycles for ten minutes.

It has long been known that electricity had a lethal action on bacteria through the chemical changes produced by electrolysis. As long ago as 1892 work on the purification of sewage mixed with sea water was carried out on a commercial scale near Yonkers, N. Y. Here the chlorin produced from the salt in the water was the germicide, the electrodes being carbon and iron plates. This process has also been recently applied in England on a scale of nearly a million gallons a day; iron plates at both anode and cathode being used.

The most successful method of electrolysis for drinking water is by the use of aluminum plates as electrodes. A plant for this purpose is working commercially in Cleveland, Ohio. The electrolyzer is a rectangular iron box. The aluminum plates are held in grooves in a slate lining. The application of 20 amp. at 15 volts, or 300 watts, in the form of a continuous current, produces sufficient electrolysis to

purify 500 gallons per hour of Lake Erie water. The water flows in a continuous stream from the city supply thru the apparatus. The action is to produce aluminum hydroxid which, as has been long known, combines chemically with the coloring matter, and most of the organic matter, and mechanically entangles all solid particles, including bacteria and fungi. The water issuing from the electrolyzer is milky from suspended aluminum hydroxid and passes to a filter filled with crushed quartz which arrests the solid matter. The effluent from the filter is colorless and of great brilliancy.

Chemical analyses show the albuminoid ammonia to be greatly reduced, usually upward of 75 per cent, and is brought down well within the limits specified by the Michigan State Board of Health, which calls for a greater degree of purification than generally called for by other States. The free ammonia is always increased, because of the electrolytic action changing a portion of the dangerous albuminoid ammonia (or of the nitrogenous matter which produces it) into the harmless free ammonia. The dissolved oxygen is increased and the organic matter which reduces permanganate of potash is diminished about one-half. No important change is made in the chlorin, but the temporary hardness due to bicarbonate of calcium is almost completely removed.

The action on the bacteria is very satisfactory. These are reduced on the average 97 per cent, and several analyses have shown a reduction of over 99 per cent. Moreover, those which pass the filter are of the harmless water-bacteria type, for in no instance in six months of continuous commercial operation has a single colon bacil-

\*A paper presented before the International Electrical Congress of St. Louis, 1904.

lous been found, though the lake water generally contains them. This result has been substantiated by weekly and semi-weekly bacterial tests.

The electrolysis evolves much hydrogen and a smaller portion of oxygen than the two-to-one ratio due to the composition of water. As the apparatus is under the city pressure, these gases are partially dissolved, so that the purified water is more fully aerated than the original lake water, which adds greatly to its palatability, and to its hygienic value.

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#### Light Therapy.

Dr. Julius Rosenberg (*Med. Record*, October 22) says the violet and ultraviolet rays are almost a specific against pain. He cites nearly thirty cases in illustration, and gives his conclusions as follows:

I—The ultra-violet light rays obtained from an iron carbon arc of high ampereage are a specific remedy in acute muscular pain, such as lumbago, torticollis, and pleurodynia.

II—in cases of acute and chronic neuritis these rays will always relieve pain, and in most cases, especially acute forms, effect recovery.

III—The bactericidal powers of the chemical light rays are easily demonstrated in inflammatory conditions of the skin of parasitic origin. In acne and furunculosis the curative effect is both prompt and certain.

IV—My results in rheumatic arthritis have not been encouraging, thus differing from those reported by German authors. This may in part be due to the limited number of treatments permitted.

V—in acute and chronic pleurisy and bronchitis the application of the ultra-violet rays is undoubtedly beneficial. I also believe that these rays could be of

assistance in the treatment of pulmonary tuberculosis.

VI—My results in gonorrhœal peritonitis and catarrhal inflammation of the deep urethra and adjacent structures are certainly encouraging, and justify further trials.

VII—I believe that the ultra-violet light rays will be of benefit in gonorrhœal and tuberculous infections of the joints; also that the pains accompanying locomotor ataxia may be relieved and controlled.

In all these cases I used a 35-ampere arc with mirror reflectors and iron-carbon electrodes. I consider the length of exposure and the iron electrodes of importance. The iron-carbon arc is very rich in chemical rays, and although other rays are not without value, the ultra-violet rays have probably the greatest potency. The penetrating power of the latter is still subject to discussion, most investigators being inclined to believe that it is slight, hardly beyond the superficial skin layer. From the results obtained in affections of deeper structures I should judge that laboratory experiments are not conclusive. How are we otherwise to explain their curative influence in diseased conditions of the deeply situated nerve trunks?

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#### The Effect of Photodynamic Substances on the Action of the Roentgen Rays.

Kothe (*deutsche medizinische Wochenschrift*) was led to experiment with various coloring matters in relation to their effect on the x-ray. It was found that photographic negatives made with plates that had been half immersed in blue-green, green or violet dyes gave very faint and blurred images on the side of the plate so treated, whereas the similar use of orange or red solutions was without

effect. The injection of weak eosin solutions (1-100 to 1-1,000) under the skin before exposure to the x-rays greatly increased the reaction, and warts subjected to this preliminary treatment decreased in size more rapidly than others not so prepared. Experiments with rabbits gave similarly positive results, parts of the body previously injected with eosin soon showing a reaction, going on to ulceration and sloughing, while the uninjected control regions were unaffected. The author considers that practical use may be made of this property in cases in which it is desired to bring about a strong reaction quickly, and that it will prove especially applicable in the treatment of malignant growths.—*Med. Record.*

#### Cancer Resulting from Exposure to the Roentgen Ray.

Two cases have recently been brought to public notice of malignant disease caused by the action of the x-rays. Early this month an electrical engineer, formerly an assistant in Edison's laboratory, died of cancer of both arms. The early history of his case, as given by Allen in his recently issued work on Radiotherapy, is as follows: When first seen he had been working for three years making and testing x-ray tubes. A year after beginning this work he suffered from a condition of his hands resembling a severe sunburn which necessitated his stopping work for a few days. He then resumed his occupation and subsequently suffered from more pronounced effects, resulting in scars and contraction. For two months before coming under observation he had an ulcer on the back of the wrist and purpura-like spots were scattered over the skin of the arms, wrists, and backs of the hands. Several operations were performed, but the disease had become sys-

temic, and the amputation only postponed the inevitable issue.

The second case, fortunately less serious in its outlook, is that of a well-known physician and x-ray worker in Rochester, N. Y., who has recently suffered amputation of one hand and the greater part of the second in consequence of x-ray injuries. The patient was an enthusiastic x-ray therapist and diagnostician and neglected to shield his hands while working. Another prominent instance of the evil effects of the Roentgen rays was that of Dr. Blacker, of England, who is said to have treated Edward VII successfully for a rodent ulcer. He had an x-ray burn of the hand, which was neglected until the cancer which had developed had extended up the arm and invaded the axillary glands, and then it was too late for operation to be of any avail.

Early in the history of the radiotherapy of cancer, when cases were reported of the disease attacking the hands of those engaged in administering the x-rays, it was thought that they furnished the proof of the contagiousness of malignant disease; but the case of Edison's laboratory assistant, above mentioned, shows that it is to the irritation produced by the bombardment of the x-rays rather than contagion that the disease must be ascribed in those instances. Why the rays should act now curatively now causatively is one of the mysteries of medicine, the elucidation of which, as Allen suggests, may lead to the discovery of the pathogenesis of malignant disease. But the immediate and important point is that they may act in a causative sense, and all workers with the rays should remember that they are dealing with a tremendous force—less immediately destructive than flame, but no less surely in many cases.—*Medical Record.*

**Splenomedullary Leucemia.**

The case of splenomedullary leucemia, which was reported by Dr. Nicholas Senn as being cured by the use of the Roentgen rays, has led to the report of two other cases which may be claimed as cures. B. L. Bryant and H. H. Crane (*Med. Rec.*, April 9, 1904) employed both arsenic and the x-rays in the first case and the latter means seemed to materially hasten the recovery. In the second case arsenic alone was used, and although the improvement was slow, it was nevertheless constant and permanent. In Dr. Senn's case arsenic was also used, so that it still seems doubtful how much of the benefit was really due to the x-rays.—*Medical News.*

**Radiotherapy for Acne Vulgaris.**

In the writer's experience the x-rays are particularly beneficial in two forms of acne: First, acne indurata, so-called, when the lesions are flatly convex, presenting no summit or peak, whether superficial or deeply situated, and when of a markedly inflammatory nature; second, in acne rosacea, accompanied more or less by active inflammatory symptoms.

When the lesions of acne are more or less deeply situated in the skin and are of a flatly convex form, such as we find in acne indurata, the curette fails to perform its proper office and glides over the little lesions, leaving them in their former condition; therefore, the lancet must be used to evacuate their contents, which causes some scarring and does not prevent the formation of new lesions in the neighborhood. Here the rays act as a specific, causing the little tumors gradually to disappear, sometimes as if by magic. Often after the first treatment have I seen marked improvement.

Mild curettage of the face on the days that the rays are not used is, in this con-

dition, often of great assistance. In the management of acne rosacea, as well as acne indurata, new lesions occasionally appear during the series of exposures, but they are non-resistant, mild and quickly undergo involution. Relapses in the majority of cases can be prevented in the former as well as in the latter condition by the proper use of the rays after the initial eradication of an attack.

The dangers of the x-rays in acne are: First, destructive dermatitis; second, atrophy of the tissues not dependent upon an active dermatitis; third, slowly progressive changes in the skin, which are spoken of in a vague way as possibly occurring years after treatment.

In the usual run of cases the first exposure is five minutes, with a soft tube, emitting enough light to show the outlines of the hand upon the fluoroscope. The hair is protected by lead foil, and also the eyes and eyebrows. The tube is placed at nine inches from the skin. Four days later a similar exposure is given. Then three days later and afterward two days. I have never seen reaction occur during these initial exposures, yet in many cases I have remarked much improvement in the acne. After the initial exposures the rays are used three times a week, the length of time varying from five to ten minutes, according to the state of the case, with the tube never nearer the skin than six inches; usually eight inches. The light is always at the initial degree and in no case does the current exceed two amperes. By this mild treatment the lesions disappear without producing erythema or bronzing.

The patient is examined in a good light before each exposure, for a reaction, and is instructed to report any burning or itching. If there is any redness of the face from any cause the exposure is delayed

until the succeeding day. During the treatment the following lotion is given the patient to sop on the face several times a day:

R Resorcini .....	1
Zinc oxidi .....	2
Pulv. calamine prep.....	1
Aq. rosse.....	6

M. Sig.—Extr. use; shake.

This preparation is soothing, mildly antiseptic and non-irritating.

In using the preparation it is well to have the patient wash it off before coming to the office, as the powder it contains might conceal an erythema.

Proceeding in this cautious manner an eruption is removed in from four to sixteen weeks. After the cure of the attack a weekly exposure for several weeks is given and then every two weeks, which I believe is a wise procedure to prevent relapse. It is always well after removing an acne eruption to instruct the patients to use an antiseptic soap and lotion constantly in the routine of their toilet, to prevent recurrence; also, to warn them against coming in contact with the skin of those infected or to use their toilet articles.—Dr. Engman in *Interstate Med. Journal*, April, 1904.

#### A Case of Mycosis Fungoides Treated by the X-Ray.

In a disease so universally fatal as mycosis fungoides, any treatment that, even for a time, seems to stay the progress of the affection, or relieves it of the distressing subjective symptoms, will be heartily welcomed.

Distributed over the whole cutaneous surface, with the exception of the face, hands and arms, and the legs below the knees, were over three thousand tumors, which varied in size from a pin-head to a

small orange, for the most part dome-shaped, freely movable, and, with the exception of one in the groin and one in the axilla, were the color of normal skin. They did not itch, and their surface was free from scales; the larger lesions were quite hard, but the smaller ones were soft. No lesions had ever disappeared, and new ones were constantly making their appearance. The largest lesion was just above the left popliteal space; it was oval in shape, three inches in its longest diameter, two inches wide, and one-half inch in height. This was the first of the tumor lesions to appear, and had been growing for three years. I began treatment with the x-ray August 17, 1903, giving daily exposures to the plaques on the front and back of the thorax, using a six-inch tube of moderately low vacuum limiting the exposures to five minutes, at a distance of five inches. Every other day I exposed as much of the surface as had not been treated as I could in a seance of one hour. On November 10, 1903, there was present no evidence of the disease (with the exception of pigment in the sites of the larger tumors, no induration, no scaling, no erythema, no tumors, and no pruritus, and whatever benefit the patient had derived must be traced to the use of the x-ray, for at no time during its use was any medicine given internally or applied externally.—Albert E. Carrier, M.D., Detroit, Mich., in the *Journal of Cutaneous Diseases*, New York, for February.

#### X-Ray in Tuberculosis.

In private practice we have continued the use of the x-ray in all tubercular cases with satisfactory results. One case of tubercular ankle-joint in a child of five years was treated for several months, the ultimate result being still *sub judice*; another case of tubercular metacarpal bone

was symptomatically cured. Two cases of tubercular cervical adenitis were cured, and one case ceased treatment. Six cases of pulmonary tuberculosis and one case of phthisis have been improved, all evidences of active disease having disappeared. In all cases of pulmonary infection the usual bacteriological tests were made to confirm the physical examination. These cases are under observation at the present time, and under perfect control, all the usual methods of hygiene and medication being employed in addition to the x-ray treatment.

Treatment in these cases must be conservative; no distinct destructive action is desirable as is prescribed in the treatment of malignant growth. We usually expose the anterior and posterior thorax over the parts affected for from three to five minutes each, using a high vacuum tube to secure penetration and avoid superficial dispersement. Treatment is given at first three times a week and when improvement sets in bi-weekly.

With this conservative treatment we have usually noted improvement within four or five weeks, same being manifested by diminution of expectoration, increase of weight, cessation of high temperature. There are many who still look askance upon the x-ray in the treatment of pulmonary tuberculosis; they freely admit its value in lupus, but they deny its efficacy in other tubercular lesions. "I have tried it," states one author, "and found it wanting." To all who have an open mind on the subject, we advise a trial of the agent. Use it conservatively, use a *high, penetrating* tube for deep lesions and supple-

ment it with the static positive breeze. Use it for a number of months before pronouncing upon its value.

Tubercular lesions are pathologically alike all over the body, so that if tuberculosis of the skin is amenable to treatment why not tubercular joints, tubercular kidneys or tubercular lungs? Microscopic examinations of patches of lupus treated by x-rays showed that degeneration of the cellular elements takes place and that *degeneration especially affects the giant and epithelioid cells of the tubercles*. This is followed by secondary inflammatory changes. The true cure of the lupus—the destruction of the bacilli, is probably accomplished by this secondary reaction and hyperamia (local leucocytosis) following upon the cellular degeneration. The peculiar and important point in lupus, however, lies in the fact that the *tubercles* degenerate promptly, the surrounding healthy tissue being less affected, so that the secondary reactive inflammation is focused in the principal seat of the lesion.—*Scholtz*.

Boggs (*Penn. Med. Journal*, January, '04) reports twenty-eight cases of tuberculosis treated with x-ray. Two cases of ulcerating tubercular laryngitis are cited, one cured, the other improving. Of five cases of tubercular joints treated three were discharged cured, one improved and one gave up treatment. Thirteen cases of pulmonary tuberculosis were cited, two were symptomatically cured, seven improved, four died—the latter were practically hopeless when received. Five cases of tubercular glands were treated, three were cured and the others improved.—*N. Am. Jour. of Homeopathy*.

## Pulmonary Tuberculosis

BY F. B. BISHOP, M. D., WASHINGTON, D. C.

Static electricity in the form of a convective discharge acts at once, as a tonic to the nervous, vascular and muscular systems, while the ozone generated, if so conducted as to render it available in respiration, will stimulate the centers, both nervous and vascular, as well as add oxygen to the blood. If this is true, and the author believes it is, we have in static electricity a very beneficial therapeutic agent in the treatment of tuberculosis of the lungs, in its early stages.

The static cage as designed and constructed by the writer, has been used by him in the treatment of several cases of tuberculosis, and in the majority of the cases with most excellent results.

The cage is constructed of wire netting and is three feet in diameter and two feet high, with tinsel brushes about ten inches apart, on the inside. The cage is suspended from the ceiling by cord and pulley, so that it may be lowered over the patient, when in use and pulled up to the ceiling out of the way when not in use.

The current may be administered in two ways, either direct or indirect; that

is, the patient may be placed upon the platform and connected to the positive side of the machine, while the cage is connected to the negative side. Or, the patient may sit in a chair on the floor, and the positive side of the machine be attached to water or gas pipe, while the cage is connected to the negative side of the machine. The cage is lowered over the head of the patient, so that the connective discharge is felt around the head and over the shoulders. The machine is put in motion and the patient instructed to breathe deeply and regularly; the treatment lasts half an hour, and should be given daily.

One reason for making the patient the positive pole of the machine is the well-known action of static electricity upon atmospheric air. As the air is broken up into its constituent elements, the oxygen is attracted to the positive pole and surrounds the head in its efforts to get to the negative cage, consequently the patient is compelled to breathe ozone sufficiently mixed with atmospheric air to render it non-irritating.—*Med. Progress.*

### The Roentgen Rays in Osseous Tuberculosis.

Fortunately the Roentgen rays enable us to recognize a tuberculous focus at an early stage, thus giving the surgeon a chance to perform a conservative operation, while at the late stage of extensive destruction such effects prove to be futile.

At the early stage of tuberculosis osseous atrophy at the epiphyseal ends is always found to a greater or lesser extent, which is caused by a deficiency of calcareous deposits.

The less calcareous substance the atrophic area contains the more translucent it becomes by the rays, thus showing a characteristic light shadow. In late stages when cheesy foci form, their areas appear still more translucent.

As a rule, the articular outlines of a tuberculous joint have lost their regularity and appear diffuse, cloudy and often shaggy. The cortex is sometimes partially destroyed and leaves the impression as if a piece had been bitten out.

In tubercular coxitis, the spontaneous upward dislocation of the femur and the separation of its head from the acetabulum is recognized. In obscure cases the rays differentiate it from rheumatism, arthritis deformans, congenital dislocation, fracture of the neck of the femur, epiphyseal separation, neuralgia, or osteomyelitis. The healthy joint must always be skigraphed at the same time for comparison.

In a normal hip joint there is a regular semi-circular light area between the femoral head and the acetabulum, while in a tuberculous hip the articular outlines, instead of being regular and marked, are irregular and diffuse. In the beginning of the process, however, these signs may be overlooked. Slight projections of the femoral head are often found at an early stage and indicate the presence of fungous granulations. Later, cheesy foci in the acetabulum, the head, the neck and the trochanter major can often be detected. Such processes must be differentiated from osteomyelic foci, which have originated within the bone and gradually entered in the joint. After the healing process is completed the degree of atrophy of the femur and the extent of the ankylosis can be well studied. Osteomyelic foci and sequestra are naturally well shown.

Regarding tuberculous spondylitis, it must be said that the only marked signs consist sometimes in the presence of an abscess below Poupart's ligament, the nature of which would not be properly interpreted if the plate did not prove the existence of vertebral changes.—*Carl Beck in Med. Progress.*

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#### X-Radiance in Epilepsy.

A considerable number of cases of epilepsy of varying duration have been given

x-ray treatments, and the results reported in the journals. When the condition has not been established for a long time, the results are very encouraging, and especially is this the case in young subjects. It is generally accepted that x-ray treatments, if not pushed beyond the proper limit, stimulate protoplasm into greater vital activity, and this may be the cause of the improvement in this class of cases.

Dr. Brant, New York, gives three treatments a week, beginning with five minute exposures at fifteen inches distance, and by degrees increases to ten minutes at ten inches. A different part of the skull was exposed at each sitting, and a tube of high penetration used. The hair drops off usually near the parts exposed, but returns again later in stronger growth. In some cases the bromids can be dispensed with; in others, small doses prove beneficial. In young subjects a gain of weight soon results, and a marked improvement in the mental faculties takes place. The impediment of speech, which occurs in severe cases of long standing, has been removed by the raying; and the attacks, which numbered from six to ten a day, would be reduced to one every two or three weeks.

It is to be hoped that these results will be confirmed by others. I recall a case where I took two radiographs of the head with a view of locating the cause of the seizures. He had no attacks for over two months following the exposures.—*Canada Lancet.*

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#### Suprapubic Cystoscopy.

Donald Kennedy, M. D., Denver, Colo., describes in the *Colorado Medical Journal* a new cystoscope. The instrument consists of a tube eight cm. in length, fitted with a trocar. At the proximal end there is an air tube for the attachment of an

air dilating apparatus. There are, also, a light carrier, the distal end of which is bent so that when it is introduced thru the tube the light is not in the line of vision, and a periscope, which increases the area under observation.

To use the instrument the bladder is punctured suprapublically and the urine withdrawn. The light carrier is introduced and current turned on. This will give a direct view of the bladder wall and will permit the use of small instruments, such as urethral forceps, probe, cautery, etc. To obtain a view of the entire prostate, stone, tumor, or foreign body, the periscope is used. After it is inserted the bladder is very slowly dilated with air. At a distance of one-half inch the periscope will bring under observation a circular area, three inches in diameter, enabling the operator to determine the contour and size of all growths and foreign bodies.

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#### The Treatment of Furunculosis by Heat.

In the consideration of the treatment of furunculosis by heat, Karl Ullmann says that heat, usually in the form of hot poultices, is probably one of the oldest methods of treatment in these cases, and that it has also been recommended in more modern times. Even with the more simple devices, the application of heat is certainly useful, and tends to prepare the furuncle for operation by softening the infiltrate. Curative effects, however, are obtained only by prolonged applications at high temperatures.

With constant moist heat one is able to soften hard and deep-seated furuncles in the shortest and least painful manner, so that the surrounding induration disappears, and the central necrotic core is quickly cast off. Later the inflammatory infiltrate surrounding the core is ab-

sorbed usually without any surgical assistance. Among the twelve cases treated by the author, it was necessary to make very small surface incisions, usually only the enlargement of the opening which was spontaneously produced by the treatment with heat, to remove easily the softened and loosened core. In most of the cases not even this was necessary, as the furuncle opened spontaneously on the second, third, or at the longest on the fourth day, according to the amount of infiltration present. With very light pressure the pus can be evacuated, then the core is easily and painlessly removed with pincers. If the treatment is continued, the infiltrate disappears in one or two days, and the center is filled in by granulation tissue without leaving a noticeable scar.

This painless procedure and the absence of scar formation even in cases of extensive infiltration, in contradistinction to the pain and scars after cruciate incision or curettage of the cavity, and the almost constant absence of other smaller furuncles, renders this method of treatment by heat, if rationally applied, the most successful both to physician and patient. Especially is this true of multiple furunclosis, usually of the neck, which is so common.

Among the twelve cases mentioned, there were two cases in which for one and one and a half years respectively one furuncle followed another in spite of preventive measures and radical surgical intervention at the start and during the course of the disease. The patients finally decided to try the treatment by heat. One case was treated ten times in fourteen days, and the other thirty-four times during a period of one and a half months, each treatment lasting from two to three hours. The cure was complete, so that there were no recur-

rences. Among the twelve cases were several diabetics, and in these the results of the heat treatment were uniformly good. Some of the cases had more or less fever, but this soon disappeared under the treatment.

The skin temperature of these treatments averaged from 40° to 42° C. (104°-107.6° F.), with no discomfort on the part of the patient and no subsequent irritation of the skin. The effect of the heat was greater when the compress beneath the thermophore was kept moist by protecting it with bandages.

The technic in such application is very simple. Coils resembling Leiter coils or simple metal plates or rubber bags for the more irregular parts may be employed. Altho these overlap the healthy skin, no harm is done. On the contrary, it stimulates the circulation and resistance of the surrounding tissues so that the infection in the lymph channels surrounding the area is rendered less virulent, and metastasis much less likely to occur.

As to the length of time of treatment, two or three hours daily would usually be sufficient, and six to eight days would be ample time to cure an average furuncle. In very severe cases with glandular swelling and high fever, it would be advisable for the patient to have a continuous application of heat, with rest in bed.

The temperature of the application must be regulated by that of the skin, this being determined by the small, flat sensitive thermometer placed beneath the thermophore.

The question may arise as to whether the thermic treatment can take the place of radical operative measures in severe infectious cases accompanied by fever, or whether it only serves to prepare them for operation. The results obtained in some very severe cases would make us be-

lieve that it is efficient in all cases, rendering the necessity for radical surgical measures very unlikely.—*Translated from Blätter für klinische Hydrotherapie.*

[We have thoroly tested and proved the value of the hydriatic method in dealing with this disease in various forms during thirty years of active practice. Fomentations are applied to the affected area every three hours for ten minutes, with the heating compress in the intervals. This consists of a cheesecloth or linen compress wrung from cold water, covered with mackintosh and flannel. This continuous application of heat has given better results than any other method yet employed.—*Ed. Modern Medicine.*]

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What would you do for a case of insomnia? In addition to removing the cause (gastric or intestinal indigestion, worry, mental overwork, toxemic conditions, etc., etc.) the use of the positive crown-breeze would yield good results. The application of a cold moist pack from the feet to the neck (the "Spanish mantle" of the hydrotherapeutists) is an excellent and very effective sleep producer. As a rule the patient falls asleep before he is taken out of the pack. Any measure which would result in depleting the intra-cranial vessels and drawing the blood toward the lower extremities would produce the desired result. Put the lower half of the patient's body in the hot-air cylinder and place a cold moist cloth on his forehead. The effect is usually prompt.

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A case of telephone-ear came under the writer's observation recently. The patient was a young lady who was employed in the central office of the telephone company. She complained that she could not hear as well as usual. There was no organic trouble in the ear. The condition was

purely neurotic. The patient heard everything distinctly, except the voice of anyone speaking to her over the telephone. Cases of this kind have been reported by many observers. Two weeks' rest and daily applications of the static breeze in the inside of the ears restored her. There has been no recurrence in eight weeks.—*Electro-Therapeutics.*

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#### The Pernicious Effects of Alcohol in Pneumonia.

In a very comprehensive article on pneumonia in the *London Lancet*, June 11, 1904, Dr. John Hay expresses some strong opinions concerning the use of alcohol in the treatment of threatened cardiac failure in this disease. He declines to call alcohol a stimulant, a position which is held by many eminent physicians.

The action of alcohol on the circulations is briefly as follows: After its absorption, alcohol exerts its specific action—dilating the peripheral blood vessels and lowering the blood pressure, thus tending to empty the arteries and to fill the veins. On the heart itself, directly, alcohol seems to have no stimulant effect at all; in large doses it enfeebles it. Such is the opinion of Professor Sherrington. Its action on the centers in the bulb is from the first depressant. The total action of alcohol on the heart being depressant, it is futile to give it in cases of commencing cardiac failure with the idea that you are combating that failure by giving a specific cardiac stimulant. The peripheral vessels are, as a rule, sufficiently dilated in response to the pyrexia, and there is no useful object to be gained by further dilating them with alcohol.

We have not space to consider the toxic effects of alcohol on the protoplasm of the heart muscle, accentuating the degener-

ative changes inaugurated by pyrexia and toxemia; its action in binding the oxygen more firmly to the hemoglobin, thus preventing the fullest supply of oxygen to the tissues; its action in shortening diastole or the resting period of the heart's muscle; or its action in interfering with the nutrition of the heart muscle by diminishing the flow of blood in the coronary arteries and the elimination of waste material, both of which may take place mainly during diastole. All these factors, slight in themselves, tend to the production of cardiac failure.

The reason that many practitioners hold so firmly to their belief in the use of alcohol is because they have not seen any other method tried; they take its value for granted, as they are biased from the very beginning. In the majority of instances not the shadow of a doubt ever crosses the doctor's mind as to its efficacy, and the result is that if the patient lives after the administration of large doses of brandy, he believes that the brandy was largely instrumental in the recovery; while if the patient dies, he consoles himself with the thought that everything possible had been done to prevent the fatal issue.

A series of 150 cases was divided into two sections, the first composed of forty-seven cases, not in any way selected. Every case that came in on certain days was included in this section, and these coming in on the remaining days of the week were in the second section. These 103 not under Dr. Hay's care received alcohol when the ordinarily accepted indications for its use arose, while the forty-seven under Dr. Hay's care received no alcohol.

The patients in each section were of the same type; they were drawn from the same districts, and were attacked at the same season of the year. The nurs-

ing was the same throughout the hospital, and the food came from the common kitchen. Under such similar conditions, if one finds that any particular line of treatment gives exceptionally good results in a large series of cases, one is justified in ascribing to it some proportion of the success. The result in these 150 cases was definitely, one might say startlingly in favor of that treatment in which alcohol was not administered.

In the first section, forty-seven cases, there were fourteen deaths, or a mortality of 29.5 per cent while the second section, 103 cases, there were forty-seven deaths, a mortality of 45.5 per cent, giving a difference of 16 per cent in mortality. The average age of the patients was the same in both sections.

Eliminating from the statistics all those dying within twenty-four hours of admission to the hospital, the results are as follows: First section, forty-two cases; nine deaths; mortality, 21.4 per cent. Second section, eighty-seven cases; thirty-one deaths; mortality, 36.8 per cent; showing a difference of 15 per cent in the mortality.

There may possibly be several causes for this variation in death-rate, but the obvious and outstanding cause is the administration of alcohol in one section, and its non-administration in the other, and it is certain that it is this factor which is largely responsible for the difference in mortality.—*Modern Medicine*.

**Dermatitis of the Hand in an X-ray Operator.**—R. Mühsam (*Archiv für Klinische Chirurgie*, vol. 74, No. 2) reports a case of severe dermatitis occurring on the hand of a physician who had employed x-ray since 1897. Three years later the dermatitis first developed. The skin scaled and there was local inflammation. Notwithstanding the patient ceased using the x-rays the condition grew worse.

The nails grew irregularly and became brittle. The right hand was most involved, and an inflammation developed under the nail of the index finger. The nail was removed, which left an ulcer which was very painful, for which amputation of the finger was done. The stump did not heal for nine weeks. Examination of the finger which was removed showed an obliterating endarteritis.—*Ex.*

#### X-Ray Tubes for Use with Static Machines.

W. S. Sharpe (*Lancet*, October 1, 1904) says that it is common knowledge that powerful static machines are capable of exciting an x-ray tube in such manner as to give off steady rays of great brilliancy. The difficulty has always been that the rays are apt to decline suddenly in power, the current finding any other path rather than through the tube. To obviate this difficulty he has contrived a simple device. It consists of a brass ball of a fair size (an inch and five-eighths in diameter), fitted over each terminal of the ordinary bi-anodal tube, the anode and antikathode being connected by a stout round brass rod (three-eighths of an inch in diameter). This supplies terminals of some electrical capacity, and at the same time does away with all edges, salient angles, and points of metal from which induction may take place. The tube is connected to the machine by means of a thickly insulated wire fitted with a fair-sized brass ball at each end, and these need not quite touch either the terminal knobs of the machine or those of the tube. By this means he obtains from a 12-plate, 30-inch Wimshurst machine rays as steady as the light from an incandescent lamp. They have great brilliancy and penetrative power and are much less trying to the eyes than the flickering light obtained from a coil. With this apparatus the tube never becomes hot.—*Er.*

### New Ozonizer.

Few people but those directly interested, probably, fully realize the increasing importance and number of the applications of ozone, and the amount of attention which has been devoted to the improvement of ozonizing apparatus during recent years. We have from time to time published articles on the subject, the last of which appeared on August 19th last, and we now have pleasure in giving a description of a new and greatly improved apparatus, the principle of which is due to Mr. A. Rosenberg, and which has been brought to our notice by Mr. Edward L. Joseph, lately the manager of the Consolidated Electrical Company, Ltd., who is the owner of the patent. A small-sized apparatus has been at work from time to time in our office during the past fortnight, and, so far as can be judged by a merely qualitative test, produces ozone freely and without the accompaniment of unpleasant nitrous oxides, etc.

As a matter of fact, the last mentioned qualification is one of the chief advantages claimed for the new apparatus; other important features are the very large output of ozone for a given expenditure of energy, and the great reduction in the cost of the ozonizer.

In the main, the apparatus consists of a mahogany box measuring about 16x16x28 inches, lined with asbestos board, and containing a small electric fan to produce the necessary circulation of air, a number of baffle plates on which the actual ozonizing grids are fixed, and a small step-up transformer. The front of the box is made removable, and carries the switch gear, which simultaneously controls the fan and the ozonizer, and makes connection with the internal parts by means of spring contacts, thus there are no loose connections to be handled. The remaining apparatus

consists solely of a small direct-current motor fitted with slip rings from which an alternating current can be collected, to feed the transformer, and this can, of course, be dispensed with when an alternate current is available.

The ozonizer proper is of the type in which the discharge takes place in the substance of the air under treatment, as distinguished from those in which the air is completely separated from one or both of the electrodes by means of glass or other dielectric. Each element of the ozonizer consists of a thin sheet of highly insulating material, such as micanite, against which are applied, on either side, sheets of copper gauze having forty meshes to the inch. These sheets are connected alternately to the two poles of the step-up transformer, which gives a potential difference of 4,500 volts—this having been found by experiment to be the best pressure for the purpose.

It will be seen that the current of air drawn through the ozonizer by the fan is constrained by the arrangement of the elements, acting as baffle-plates, to pass over the whole of the ozonizing surfaces, which have an area of nearly four square feet in the apparatus in question. As at each corner of each mesh of the gauze the wire is necessarily bent, so as to form an elevation, which may be regarded as a rounded point, there are 230,400 such points to every square foot of the ozonizing surface, or a total of over 900,000. From each of these a discharge takes place upon the surface of the dielectric, but, owing to the extreme sub-division of the discharge, there is no sparking whatever, and hence no nitrous compounds are formed—a very important advantage. The air inlet is guarded by a stout netting of brass wire and all the high-pressure apparatus is enclosed within the case; as the connec-

tions are necessarily severed in the act of opening the case, it is impossible to obtain a shock from the apparatus. The current supply is obtained by means of flexible connections and plugs from ordinary lamp-holders, but, of course, more substantial connections can be made where the apparatus is permanently fitted up. Lastly, we may add that the whole of the ozonizer, which was made from Mr. Joseph's designs, and embodied many of his improvements, is well finished, and forms quite a handsome *ensemble*. Owing to the simplicity of the apparatus, it can be made in many other forms, to suit the requirements of special cases. Thus, in the case of a building having a ventilating shaft to supply fresh air, it is not necessary to have the fan or the wooden case; a set of the ozonizing plates can be fixed at a convenient position in the shaft, together with the step-up transformer.

We understand from Mr. Joseph that some remarkably successful experiments have just been made by means of this ozonizer in connection with the perfect combustion of fuel in furnaces. This may open up a new field for the use of ozone.

As for the output of the apparatus, we are informed that it is capable of ozonizing 30,000 cubic feet of air per hour, with the expenditure of sixty watts, including the losses in the rotary converter, which do not enter when an alternating current supply is available. At a price of 2d per unit, therefore, the cost of 30,000 cubic feet of ozonized air, suitable for the aeration of a living-room or workshop, would be no more than 1/2d. These results, we believe, are quite unprecedented. The actual production of ozone is said to amount to no less than 250 grams for an expenditure of one unit.—*Electrical Review.*

#### Newly Discovered Property of Tin-Aluminium Alloy.

In a paper lately read before the Academie des Sciences, M. Hector Pecheux brings out a rather remarkable property which he observes in tin-aluminium alloys. If a rod of such alloy, having a freshly filed surface, is placed in cold distilled water at 13° C., an abundant supply of gas is given off from the filed part of the rod. This generally stops after two or three minutes. This phenomenon was observed with four alloys containing different proportions of the two elements. Analysis of the gas shows oxygen and hydrogen in the proportions of an explosive mixture. A rod of one or the other metal alone, or a rod which is not filed at the surface, will not cause the action. The rods he used were cast in a sand mold. Considering that on account of the sudden cooling in the mold the surface of the rod may have become tempered, he concludes that the action is due to this cause; at the surface of the rod the alloy takes the form of juxtaposed molecules of the two metals, and in the cold water these act like a series of thermo-electric elements of tin-aluminium (owing to the heating of the rod by the operation of filing), and the water is decomposed. This is due to the fact that the molecules of tin and aluminium have a considerable difference in specific heat and after the filing they have not the same temperature. Therefore they set up an electromotive force due to the thermo-electric action, and this stops when they become cooled by the water. If a filed rod is placed in an acid copper sulfate solution, bubbles of oxygen are given off and copper is deposited on the rod. A non-filed rod of tin or aluminium precipitates the copper, but no gas is given off.  
—*Modern Med. Science.*

## EDITORIAL

With this number begins the sixteenth volume of THE AMERICAN X-RAY JOURNAL, which was founded in 1897 by Dr. Heber Robarts, of St. Louis, Mo. Its name has been suggestive rather than descriptive, as it was never intended to limit the journal to the discussion of x-rays. The present is a fitting time to adopt a name which more fully describes the field we aim to cover. The amalgamation of THE ARCHIVES OF ELECTROLOGY AND RADIOLOGY with this journal gives an increased strength in the present and the promise of greater things in the near future.

Innumerable journals attempt to cover the fields of general medicine and surgery. These fields, as such, THE AMERICAN JOURNAL OF PROGRESSIVE THERAPEUTICS will let alone. Electrical science and electro therapeutics will be the center of our field. On the one side will be other physical agencies—mechanics, heat, light, etc.—and on the other side those psychic forces which as yet defy classification, but which are of stupendous import in the healing art as in daily life.

We have no hobbies to ride and hold no opinions that are not constantly subject to revision in the light of new discoveries. We believe that in the newer methods of therapeutics there is much that should be made familiar to every practitioner. A physician is like an artisan in this, that he should be able to take immediate advantage of every new implement and method that may enable him to do better work. We purpose doing our part to spread the knowledge of

these methods and implements on the physical and psychic side.

A journal can give out only what it receives. We invite every one to send to us reports of everything new and valuable on these lines. New ideas are welcomed. Systematic tests of new methods are of value to the whole profession.

THE AMERICAN JOURNAL OF PROGRESSIVE THERAPEUTICS stands for truth and honesty. There is an old idea that the word lawyer is a synonym for liar. During recent years, in the estimation of the public, doctors have fallen into the class to which David once hastily consigned all men. This, if it be true, is a calamity. Honesty and truth are the only foundations upon which our social structure can safely rest. Amongst scientists a liar has no standing. They have no use for him. It should be so among us, and it will be so if each one looks well after his own conduct.

This journal will strive to keep its readers informed of the best that of the world along our chosen lines, and to make of practical value to physicians the best that science offers.

---

Some of the wrappers for use in sending the December number of THE AMERICAN X-RAY JOURNAL and THE ARCHIVES OF ELECTRICITY AND RADIOLOGY were lost. Will those who failed to receive their December journal kindly notify us so that we can supply the omissions?

---

All payments due the ARCHIVES should be made to the American X-Ray Publishing Company, Masonic Temple, Chicago.

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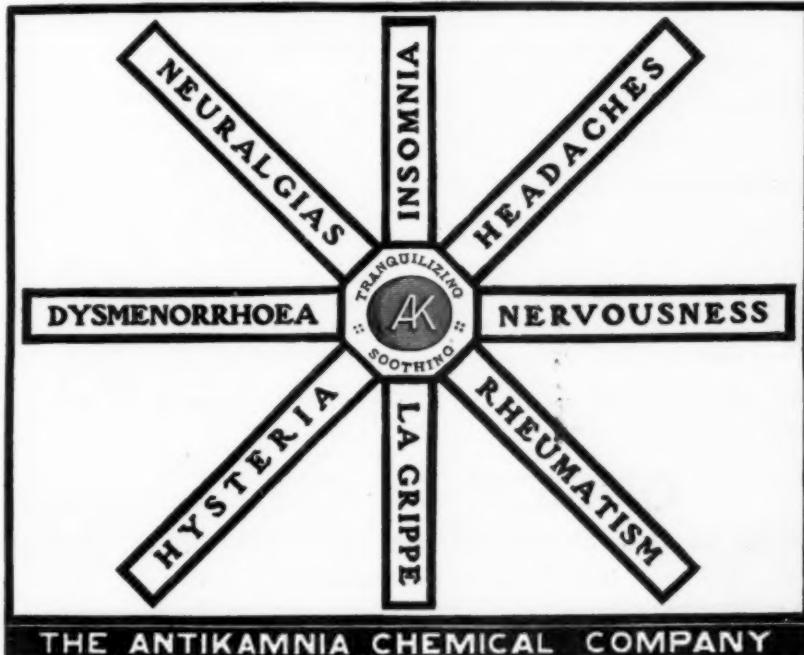
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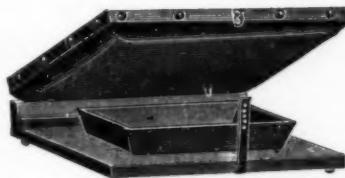
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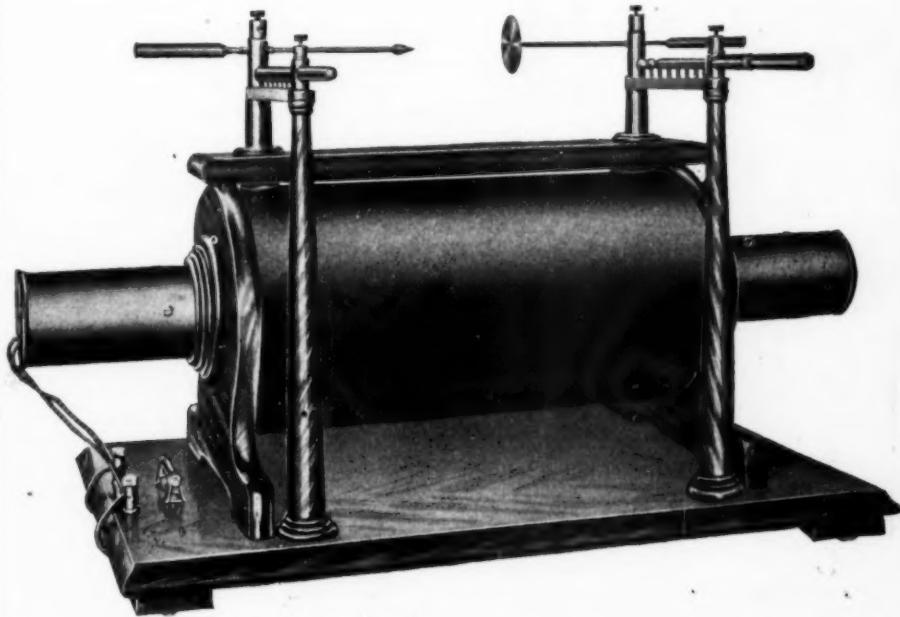
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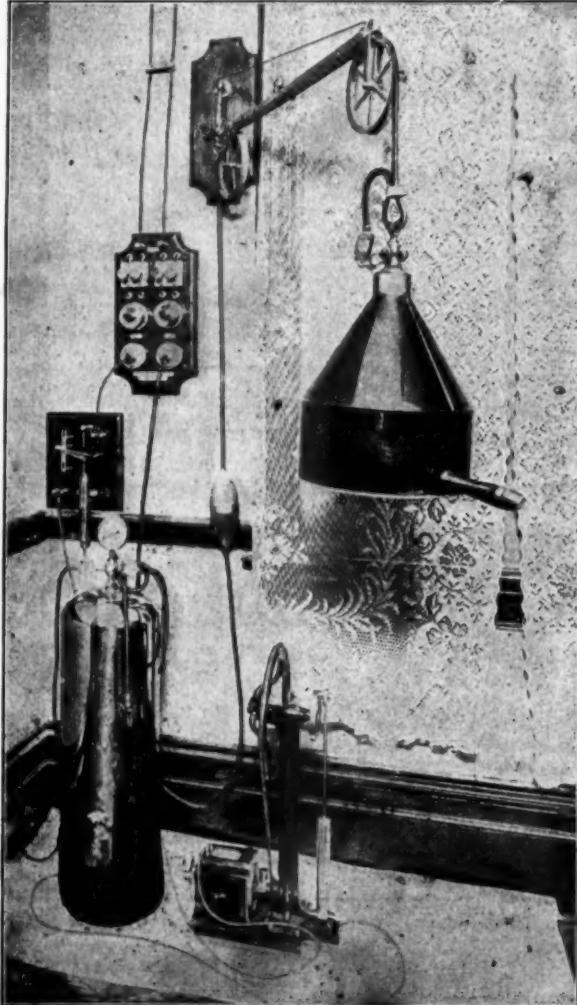
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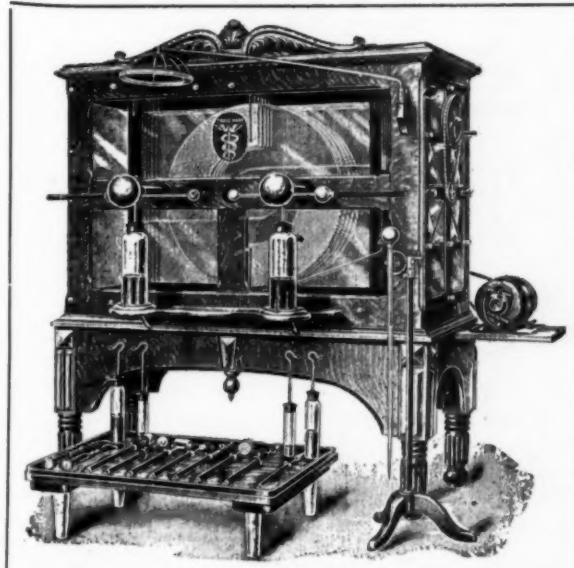
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WASHINGTON, D. C., January 21, 1902.

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DEAR DOCTOR.—After three months of capable, unprejudiced, exhaustive labor and research, the authorities at the Barnes Hospital, U. S. Soldiers' Home, Washington, D. C., have given us an order for the Waite & Bartlett Mfg. Co. Static Electrical Machine and X-Ray Outfit which has been on trial there in competition with the Van Houten & Ten Broeck's (Otis, Clapp & Co.) apparatus.

Crucial tests, which are absolutely impartial, were made during the period the machines were on trial, because it was the purpose of those in charge of the matter to buy the best apparatus obtainable.

Simultaneously with that trial, another investigation was in progress at the Children's Hospital in this city, where the same makes of apparatus were in full operation, and this institution also concluded that the Waite & Bartlett Mfg. Co. equipment was the best, and we likewise received their order for the complete outfit.

These orders are the outcome of painstaking investigation, and the victory of the Waite & Bartlett Mfg. Co. in both cases is one to be proud of, for their apparatus is thus stamped as the best now in the market, both for therapeutic purposes and X-Ray work.

Another fact to prove the excellence of the Waite & Bartlett Mfg. Co.'s apparatus is that there have been eleven of their Static Machines sold recently in Washington, the purchasers being as follows:

The U. S. Senate.

Dr. F. E. Gibson.

Dr. Robt. Reyburn.

Dr. H. H. Hawxhurst.

The Children's Hospital.

The U. S. House of Representatives.

Dr. F. A. Gardner (two outfits).

Dr. C. H. Heron.

Dr. H. Krogstad.

The Barnes Hospital, U. S. Soldiers' Home.

Yours very truly,

Z. D. GILMAN.

N. B.—This is a copy of letter received by us from our agent at Washington, which speaks for itself. Yours truly,

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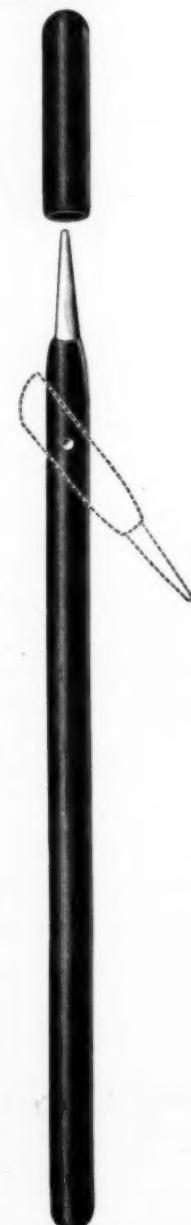
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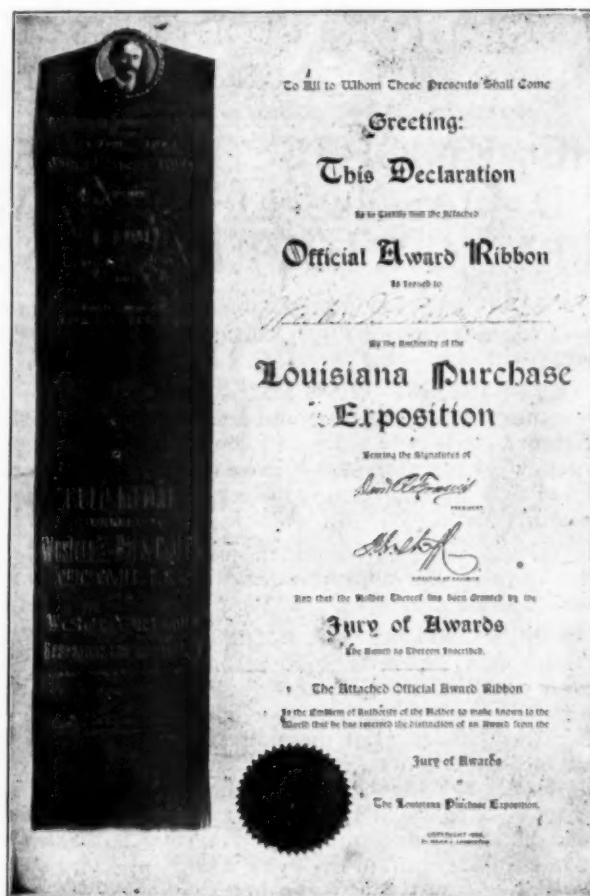
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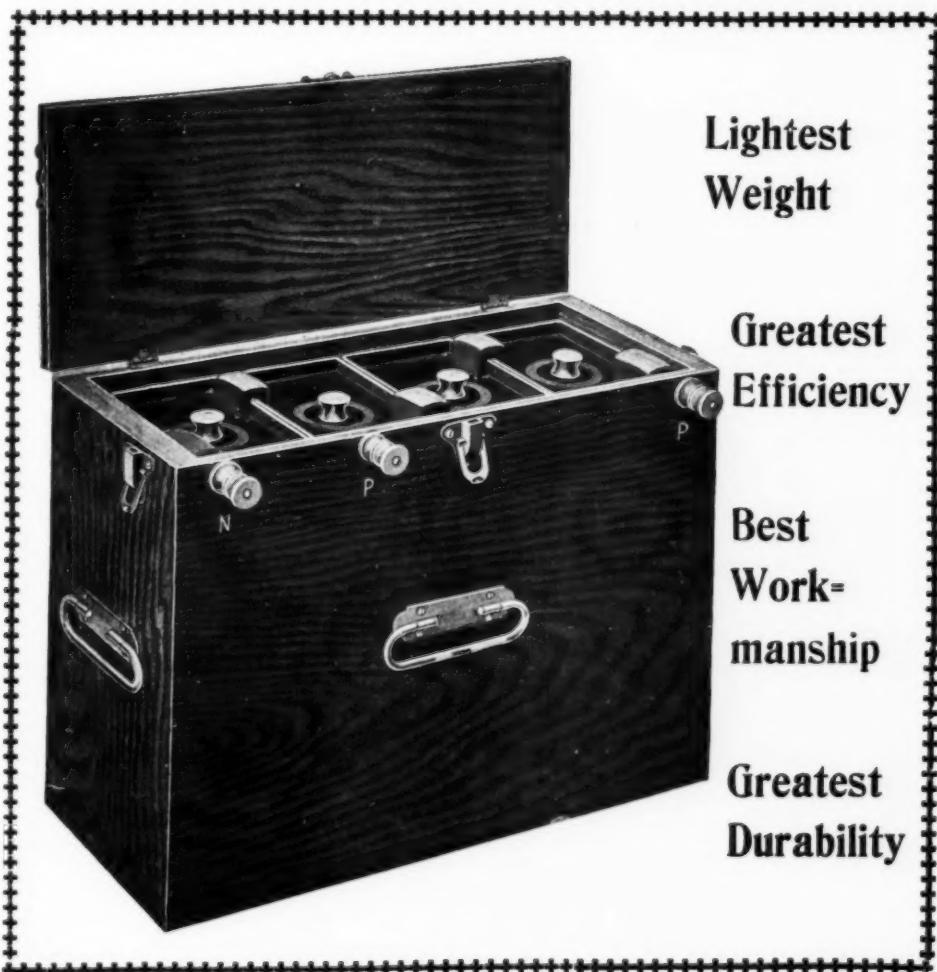
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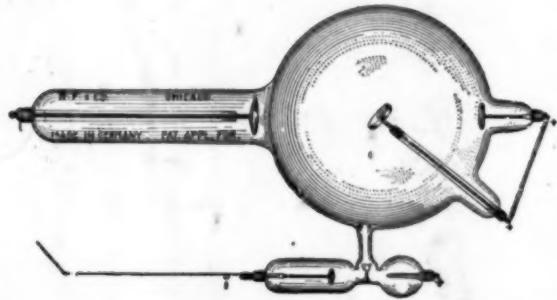
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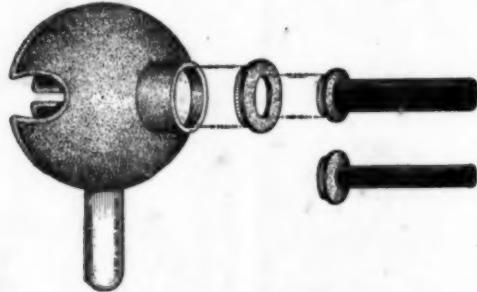
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